THE RHODESIA

Agricultural Journal.

Edited by the Director of Agriculture
(Assisted by the Staff of the Agricultural Department).

PUBLISHED MONTHLY.

Subscription: 5/- per annum; payable to the Accountant, Department of Agriculture, Salisbury.

VOL. XXIX.] MARCH, 1932. [No. 3

EDITORIAL.

Contributions and correspondence regarding subjects affecting the farming industry of Southern Rhodesia are invited. All communications regarding these matters and advertisements should be addressed to:—The Editor, Department of Agriculture, Salisbury.

Research Work in connection with Foot and Mouth Disease.—The urgent necessity for continuing research into the type of foot and mouth disease prevalent in Southern Rhodesia was emphasised at the Veterinary Conference held in Salisbury in December. At that time the work already carried out by Mr. Bevan and his colleagues in the Veterinary Research Laboratory in Salisbury had established a *prima facie* case for the belief that the disease in Southern Rhodesia differed materially in type from that generally known in Europe. There was no room for doubt that the disease was foot and mouth disease, but its behaviour under laboratory conditions differed in various respects from that which would be anticipated from a study of the work carried out by the Foot and Mouth Research Committee appointed some years ago in Great Britain, and it appeared possible that the type of disease might be such that methods of control far more lenient than those necessary under European conditions

would suffice to prevent the spread of the disease in this Colony and its transmission to other territories by the export of vegetable products, or in fact by any export other than live cattle.

The visiting veterinarians, whilst impressed with the provisional results already obtained, could not reasonably accept this provisional work as conclusive, and urged in the interests of the Colony and of South Africa as a whole that specific investigation be carried out on certain indicated lines. Of these the most urgently important was the definite establishment of the "type" to which the disease belonged.

This work could not be carried out in Southern Rhodesia except at enormous cost and with a great deal of delay, and Mr. Bevan, having succeeded in transmitting the local virus in a viable condition to the research laboratories at Weybridge, has now gone himself to work there in collaboration with Dr. Horner Andrews and other recognised authorities under the ægis of the British Foot and Mouth Disease Commission.

The establishment of the type was the matter of the most immediate importance, but there remain definite investigations as to the behaviour and infectivity of the disease under local conditions—not only in the live animal, but in bone marrow and similar products—and also further investigations into the possibility of its transmission by animals which had recovered from its apparent effects, and also by such products as maize, monkey nuts, etc. Although the preliminary work indicates that these possibilities are small, it is most important that the actual facts should be ascertained by scientific enquiry with the least possible delay, and work in this direction is continuing at the laboratories in Salisbury.

Arrangements have been made for the transfer of a research officer, who will be appointed by the Ministry of Agriculture in England, to the laboratories in Salisbury to continue local investigation in all such directions as may appear to be desirable or necessary.

The ordinary work of the laboratory, and some part at least of the investigations into foot and mouth disease, will continue as heretofore under the charge of Mr. Lawrence.

It is hoped that as foot and mouth disease research work is of vital importance to the whole of South Africa, some contribution towards the cost of this work will be obtained from adjoining States.

Mr. Bevan will bear with him the good wishes of the Colony in the very important work in which he is engaged, and if he should be able to bring it to a successful termination and satisfy our neighbours that considerable relaxations of the embargo may be permitted with safety, his achievement will be a fitting crown to his long and valuable service in Southern Rhodesia.

Enquiry into the Bacon Industry.—Representations are frequently made to this Department in regard to the "unsatisfactory state of the pig industry in this Colony." Many producers are of the opinion that there is unfair competition from the south, and that manufacturing and distribution costs within the trade are too high. To obtain as full information on these points as possible, and to make some statement as to the prospects of the industry, a departmental committee, consisting of Dr. A. E. Romyn, Mr. E. R. Jacklin and Mr. C. A. Murray, has been appointed.

This committee met the Rhodesian and Matabeleland Agricultural Unions, a number of farmers, a number of the more important retailers and wholesale distributors in the trade and inspected the two chief bacon factories during February. The committee met with good feeling on all sides and secured a good deal of useful information. The report of the committee is now being prepared.

Leaf-Curl in Tobacco.—A severe outbreak of leaf-curl occurred on a tobacco farm at Mtepetepa. As the result of a visit by the Plant Pathologist and Tobacco Officer to inspect this farm, the Government decided to ask the Director of the East African Agricultural Research Station, Amani, to allow Dr. H. H. Storey, the Plant Pathologist of that station, to visit Southern Rhodesia to give advice.

For the last ten years Dr. Storey has been paying particular attention to the virus diseases of cultivated crops, and published particulars of a disease in tobacco which it was thought was the same as the disease in this country.

Owing to the difficulty of communication, an aeroplane was sent from Salisbury to convey Dr. Storey from Mbeya, and he arrived on the afternoon of Wednesday, the 20th January.

In company with the Plant Pathologist, Tobacco Officer and Entomologist, Dr. Storey visited some of the more important tobacco areas and Mtepetepa, and his report is published in this issue.

It is felt that the control measures suggested by Dr. Storey will be appreciated by all tobacco growers, and an earnest endeavour should be made to carry them out strictly to letter since they involve nothing but good farming practice.

At the present time the disease is not widespread, but a few individual plants were found to be infected in various centres. These indicate that there is a real danger of the disease spreading and becoming a serious menace to tobacco growing in this country unless immediate steps are taken to check it.

A number of points in regard to both the insect transmitting the disease and the disease itself still remain to be cleared up, but the Department is taking the necessary steps to secure the information required.

Hock Disease in Poultry.—An abnormal condition in poultry known as hock disease or slipped tendon has been investigated by the Agricultural Experiment Station of Pennsylvania. It has been shown that this disease is induced in experimental birds by the addition of excessive amounts of mineral salts to the ration. Bone meal, sodium phosphate, calcium carbonate and the so-called balanced mineral mixtures all caused the abnormal condition in 90 per cent. of the experimental birds. It was found that when protein concentrates are included in the ration no additional minerals

should be added, and that the liberal addition of oats and oat feed produced beneficial properties which cannot be explained on the basis of their fibre content.

Curing Tobacco by Electricity.—An interesting experiment has been made by the State Electricity Commission of Victoria, Australia, using an electrically-heated barn for curing tobacco. A series of tests were made, and the only departure from the ordinary flue-curing method was the substitution of electric heating tubes for the flues and of fans to provide the suitable movement of the air.

The experiment was so encouraging that it has been decided to continue investigations along similar lines whereby it is claimed that the fire risk is reduced to a minimum; there is no possible chance of taint from flue gases; the aroma of the dried leaf is noticeably stronger; the drying can be speeded up without the use of excessive temperatures; regulating thermostats can be employed and the minimum of attention required; loss of quality due to sponging can be eliminated; the colour is brighter and the grade is more uniform.

Report of Empire Sugar Conference.—Sugar production in the Empire from the economic and scientific points of view is reviewed in the report, published in January, 1932, by the Empire Marketing Board, of the Imperial Sugar Cane Research Conference, which was held in London in July, 1930.

India, South Africa, Trinidad, Barbados, British Guiana, Fiji, Mauritius and the Leeward and Windward Islands sent representatives to the Conference, which was opened by Mr. J. H. Thomas, M.P.

The recommendations included the setting up of four central cane breeding and research stations in India, Australia, Mauritius and the West Indies; the establishment of a cane quarantine station in the West Indies; the extension of research on biological control of insect pests; visits to various producing countries by specialists; surveys of the economic position by the Imperial Economic Committee;

investigations into methods of cultivation and labour conditions; and a closer study of the utilisation of sugar bye-products.

Warning: Locusts.—Extensive egg laying by the red-wing locust (*Nomadacris septemfasciata*) has occurred in Northern Rhodesia on the Loanja River, which enters the Zambesi River just north of Kazungula. Four small flying swarms are known to have crossed the Zamhesi River near Sesheke into the Caprivi Strip. Extensive hopper swarms of the migratory locust (*Locusta migratoria f. migratorioides*) are also reported from the Kalobo district (Barotse Province).

An invasion of Southern Rhodesia by flying swarms of the red locust may occur at any time, and since it is practically impossible to destroy the adult locusts of this species, the following instructions for the protection of crops are repuhlished for the guidance of farmers:—

The only practicable procedure is for each farmer to attempt to keep these insects from settling on his crops or fruit trees. The experience is that this is considerably more readily achieved in the case of the red-winged locust than in the case of the brown locust.

Most people are aware of primitive methods used by natives and others to keep a threatening swarm of locusts on the move. These include banging of tins, discharge of fire-arms and other methods of creating a noise, together with waving of flags made of hright coloured fabric. The best effect is likely, however, to be obtained by means of smoke smudges.

Materials for producing quick smudge fires and maintaining these for some hours should be collected and kept in position around the lands, with special attention to the side towards the prevailing wind; but other sides should not be neglected. Further material, which on hurning gives off a pungent smoke, should be placed in readiness when there is reason to fear a visitation at short notice. Green wood with leaves attached will probably be the most readily available material of this description, but, of course, anything which can be added to render the smoke denser and more foul-smelling is an advantage. In the South African

Union the following formula for a chemical smudge has been recommended:—

Saltpetre	30 parts.
Sulphur	12 parts.
Borax	8 parts.
Coal tar	25 parts.

"The saltpetre, sulphur and borax should be in fine powder or should first be ground; they should be thoroughly mixed and then added to the tar (warmed if necessary) and thoroughly incorporated therewith.

"A deep tin, such as jam or coffee tin, should be filled three-quarters full of the tar mixture, and in the top of this should be placed a layer of about a quarter of an inch deep of priming mixture, of the following composition:—

Saltpetre, sulphur and borax mixture as above ...	2 parts.
Sugar, fine white	1 part.

"In compounding this mixture it is essential that the saltpetre should be thoroughly dry; it is apt to absorb moisture from the air, and should, therefore, be dried in an oven and allowed to cool before mixing. In the centre of the priming composition a small quantity (just a pinch) of chlorate of potash (finely powdered) should be sprinkled, as this will enable the mixture to be ignited without any trouble. A few strings of cordite or gunpowder out of a cartridge could be used for this purpose. As soon as the priming composition is ignited, a lid of some sort can be put over the tin loosely. The priming mixture should burn fiercely, and in about 30 seconds a dense smoke should be produced; an ordinary jam tin, holding 1 lb. of mixture, will burn about 12 minutes. If the mixture starts into flame, a few handfuls of sand should be thrown over it to stifle the flames. There is no likelihood of it being extinguished when once fully ignited. It is of the utmost importance that the priming composition should be thoroughly dry."

It may be stated that tins of material for producing smoke smudges for the purpose of warding off locust swarms can be purchased, ready charged, in the Colony.

THE RAISING OF BACON PIGS.

(Concluded.)

By A. E. ROMYN, Senior Animal Husbandry Officer; and C. A. MURRAY, Lecturer in Animal Husbandry, Matopo School of Agriculture;

With a Veterinary Section by D. A. LAWRENCE, Veterinary Research Officer.

THE FEED AND MANAGEMENT OF BACONERS.

General.—Guess work should have no place in the feeding of pigs. As much attention should be paid to the balancing of rations for pigs as to those for any other form of live stock. The quantity of feed used should be weighed and apportioned correctly, taking into account the size of the pigs and the degree of finish that they have reached. A weighing scale to determine the progress of fattening of growing pigs is as essential on a pig farm as a milk scale is to the owner of a dairy herd.

The pig is handicapped by the relatively small capacity of its digestive system. It cannot handle large quantities of bulky or fibrous feeds. In general, the ration for baconers should be concentrated and digestible, and the pigs should be pushed for the maximum rate of growth in keeping with the system of management in vogue. As a rule the pigs which make the largest daily gains in live weight are the most profitable to the feeder.

Under local conditions there is no grain feed to equal maize. It is, however, relatively deficient in protein and mineral matter. Rye, barley and oats have the same general characteristics and they can be used interchangeably with maize or as a substitute for part of the maize in the ration.

When used as the sole grain they have less feeding value than maize, and the high fibre content of oats makes that feed unsatisfactory as a sole grain feed for baconers.

The best protein supplements for the common farm grains are separated milk, butter milk and meat or blood meal.* Cow peas, velvet beans, ground nut cake are relatively high in protein, and can be used as substitutes for these animal bye-products. They are generally, however, not quite as satisfactory, nor do they produce bacon of as good a quality. Ground nut cake has a tendency to produce soft bacon, and should not be used extensively for baconers.

Bulky crops such as roots, tubers, melons and pumpkins should only be used in moderate amounts for fattening pigs. Usually not over 3-5 lbs. should be fed per head per day.

The rate of gain will generally be increased by the provision of suitable pasture during the summer months, and by succulent or green feeds during the winter. These green feeds stimulate the appetite of the pig and provide vitamins which may be lacking in the grain ration. To ensure a proper supply of minerals, the pigs should generally have free access to a mixture of bone meal 3 parts, salt 1 part.

Preparation of Feed.—The grinding of maize results in a saving of about 5 per cent. of the feed. In the case of pigs under 150 lbs. live weight, the economy effected is somewhat less. Small grains such as kaffir corn, barley and oats should be ground for pigs. All meals should he fed as a slop. The cooking of the common feeds, except potatoes and beans, decreases their value for pigs. Separated milk should be fed either always sour or always sweet. Usually it is safer to feed it sour. Whey should be fed sweet. Butter milk has of necessity to be fed sour. Cleanliness is especially important with dairy bye-products.

Methods of Feeding.—Pigs may be fed in dry lots or sties or on pasture. The pasture system is little used in Southern Rhodesia. In this Colony the dry lot, or camp, commonly takes the place of the pasture used in other

*There is a wide variation in the protein content of the feeds sold under the general description of "meat meal," and feeders should in all cases secure the composition of the feed before purchase.

temperate countries. The lack of good pastures is unfortunate, as, where suitable pastures are available, pigs will usually make more rapid and more economical gains during the summer by this method than by any other. The dry lot, moreover, unless the camps are frequently changed, is unsatisfactory and frequently becomes a source of worm infection for the pigs. When proper pastures or camps are not available, it is probably advisable to keep the baconers in sties from the time they are weaned until ready for market.

RATIONS.

A. **For Pigs in Sties or Dry Lot.**—Suitable rations are:—

(a) Maize and separated milk or butter-milk: The most suitable proportion to feed these in is 1 gallon of milk to every 3-4 lbs. of grain.

(b) Maize and meat or blood meal: The correct proportion of the meat and blood meal will vary from 7-15 per cent. by weight, depending on the protein content of the sample.

Some green or succulent feed should be given with both of these rations.

Cow peas, kaffir beans or velvet beans may be used in place of the protein supplements just named, but in general, better results will be obtained where they form only 20 per cent. of the grain ration and the remaining deficiency of protein is made up by some animal bye-product. A satisfactory farm mixture would be maize 70 lbs., cow peas 25 lbs., meat meal 5 lbs.

In sty feeding the addition of 3-5 per cent. of a cut-up legume hay to any ration which does not contain dairy bye-products will often improve the rate of gain. Barley has a hardening effect on the carcase, and where available at a cheap price can be used with advantage for this purpose.

The pigs should be fed all the grain they can clean up in 15-20 minutes after feeding. The daily quantity consumed should usually be equivalent to about 3 per cent. of the live weight of the pig. A 150 lb. pig should consume 4½ lbs. of grain or its equivalent per day. Plenty of trough room should be provided, and the pigs should be graded into lots

of equal size and strength. Bad doers should be weeded out as they appear, and disposed of to the best advantage.

B. **For Pigs on Pasture.**—On pasture pigs make faster gains in live weight than in sties and require less supplementary protein feed. There is, moreover, a subsidiary advantage, that the pig manure is spread on the land without waste.

The amount of grain to feed to pigs on pasture is determined by the rate of gain in live weight desired and by the nature of the pasture. The heavier the grain ration, the less pasture will be consumed. A daily ration of about 2 lbs. of grain per 100 lbs. live weight will generally preserve a fair balance between the pasture and grain consumptions. Thus pigs weighing 150 lbs. live weight would receive 3 lbs. of grain per day.

The nature of the grain ration will depend on the composition of the pasture and the age of the pigs. The table which follows illustrates the quantity of meat meal (50 per cent. protein) required to balance a maize ration on some typical pastures:—

Pasture crop.	Pigs weighing less than 100 lbs.	Pigs weighing more than 100 lbs.
Kikuyu, paspalum, any young grass	10% meat meal	5% meat meal
Rape, green rye, oats and barley	10% meat meal	5% meat meal
Cow peas, velvet beans and kudzu vine	5% meat meal	None

Instead of 10 per cent. meat meal, 15 per cent. peanut meal or 2-3 parts separated milk by weight can be used.

It may be necessary to "ring" pigs running on valuable grass sod. Water and shade are essential adjuncts to pasture. A clean wallow is an advantage in the hot weather. Adequate fences are necessary, and care should be taken to keep the pastures free from parasitic infection. A mineral lick of 3 bone meal and 1 salt should be provided.

It is not generally advisable to keep baconers on pasture throughout the feeding period, and the pigs should usually be grown out on pasture to a weight of 130-150 lbs., and then

finished in sties or dry lots. This system produces excellent baconers, and the residual stimulating effect of the pasture generally lasts through the finishing period.

Marketing of Pigs.—If possible, the pigs should be got on to dry feed a day or two before marketing. Pigs ship better empty than full, especially in the hot weather, and under ordinary circumstances the morning feed should be withheld on the day of marketing. The pigs should be handled quietly and in the cool of the day if possible. The normal shrinkage in transit to market is 5 per cent. to 10 per cent.

THE FEED AND MANAGEMENT OF THE BREEDING HERD.

Feed for Dry Sows and Gilts.—The feed for dry sows and gilts in the breeding herd should be sufficiently liberal to enable the sow or gilt to farrow in the proper condition and to raise a good litter of pigs. Fat sows produce pigs low in vitality and are clumsy to handle at the time of farrowing, while thin sows cannot nourish the average litter properly. The ration should be well balanced and contain more muscle and bone-forming material than is contained in maize or other grains. As a general guide, mature sows should be fed to gain ½ lb. to 1 lb. daily from the time of breeding to farrowing, and bred gilts, so as to allow for their own growth, somewhat more.

During the summer months pasture is excellent for sows in pig. The range and green feed afforded in this way generally result in large litters and little trouble in farrowing. In the winter months, when pasture is not available, roots or succulent crops or a leafy legume hay should be fed to take the place of pastures.

As the greater part of the development of the embryo pigs takes place during the last six weeks of pregnancy, the ration should be richer in protein—the flesh-forming constituent—during that period than in the earlier stages. The ordinary farm grains, such as maize, wheat, barley, plus a good supply of succulent feed or pasture, will usually be quite sufficient for in-pig sows during the first ten weeks of pregnancy, but during the last six weeks these grains should

be supplemented by a protein rich feed. The normal protein requirements at this period can be met by adding 7-15 per cent. of blood or meat meal (depending on the composition of the sample) or 15 per cent. of peanut cake, or 2-3 parts of separated milk or butter milk—all by weight—to the grain ration in use.

If the pasture is scanty or unattractive, feed the sows on a protein supplement throughout the gestation period, increasing the proportion of the supplement towards the end

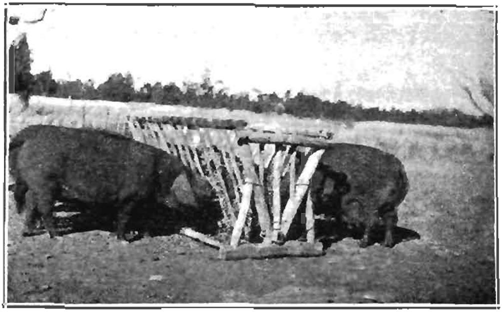


Fig. 6.
Sows feeding on legume hay during the winter.

of the period. Good pastures for sows in pig are kikuyu, paspalum, cow peas, kudzu vine, lucerne, artichokes, etc., as well as any succulent grass.

The quantity of grain to feed per day should be determined by the condition of the sow. In general, however, ½-1 lb. of grain per 100 lbs. live weight per sow for mature sows and 1½ lbs. per 100 lbs. live weight for bred gilts should be sufficient. A typical ration during the winter months for a mature sow would be:—For the first ten weeks, 3-4 lbs. maize meal per day, plus green or succulent feed *ad lib.*, and for the last six weeks of pregnancy, 4-5 lbs. of a mixture of maize 90 per cent., meat meal 10 per cent., plus succulent

feed *ad lib.* During the summer months similar results should be obtained from maize fed at the same rate on good pasture.

Gilts intended for the breeding herd can be fed the same rations as the sows in pig. They should be fed a sufficient amount of grain to ensure good growth and yet not permit them to get too fat. In general this can be effected on a ration of about 2-3 lbs. of grain per day per 100 lbs. live weight, which will usually work out at from 5-7 lbs. of grain per gilt per day.

To ensure that the pigs receive sufficient minerals, they should have free access to a mineral mixture of bone meal 3 parts, salt 1 part. Some breeders add wood ashes or charcoal to this mixture.

Care and Feed of Sow and Litter at Farrowing.—Previous to farrowing, the farrowing pens or quarters should be thoroughly cleaned and disinfected. Unless a movable colony house in clean camps can be provided, the sows should farrow in proper pens with concrete floors, which can be kept clean and free from parasitic infection. As bare concrete floors are cold in winter and often damp in summer, a boarded section of floor on which the sow can farrow is a great advantage. A small quantity of short bedding should be provided, but, as a rule, the less bedding the better. The pen should be provided with a farrowing rail about 9 ins. from the wall and 9 ins. from the ground, to prevent the sow crushing the young pigs.

The sow should be removed to the farrowing pen a few days before it is due to pig. The udder should be washed off once or twice with soap and water to remove worm eggs, and the sow groomed daily, if possible, to accustom it to handling. The ration should be made more laxative. At this time bran and peanut cake are good feeds, as they tend to prevent constipation. A day or two before farrowing, cut the ration down to half.

If the sow farrows normally it should be disturbed as little as possible. Young sows sometimes require assistance, but amateurs often do more harm than good by handling the sow at this time, and experienced assistance should, if possible, be secured if help is needed. After farrowing, the

after-birth and any dead pigs should be removed, and it is advisable to dust out the farrowing pen with slaked lime.

In the case of large litters, the number of surviving piglets should be reduced to ten or less if the sow has fewer teats available.

During the first day after farrowing the sow should be given no feed, but plenty of water to drink. In the cold weather this should be warmed. On the second day 1 lb. of grain should be given as a slop. This quantity should be increased at the rate of about 1 lb. per day to 4 lbs. at the end of the first week. During the second week the grain should be increased at the rate of ½-1 lb. per day until the sow is on full feed.

The ration should be one to stimulate milk production, and the sow should be fed to the limit of its appetite. Sows which are good milkers and which have large litters can with advantage be fed three times a day. If the sows are indifferent milkers they will sometimes commence to put on weight after the fifth week. In this case their ration should be reduced sufficiently to maintain only their weights. Where possible, sows and litters should be fed individually. The common practice of combining several sows in one lot is usually productive of a large percentage of runts among the young pigs.

Good rations at such times are:—

1. Maize 4 parts, peanut cake 1 part, plus a little animal protein, such as meat meal or separated milk.
2. Maize 1 part, separated milk or butter milk 2 parts.
3. Maize 9 parts, meat meal 1 part.

Ground cow peas or kaffir beans can take the place of part of the protein supplements named. Oats, kaffir corn or other farm-grown grain can be substituted for part of the maize. Bran is a valuable feed at this time, and if available can with advantage make up a quarter of the grain ration.

If clean pasture is available, the sow and litter can be turned out to graze when the piglets are two to three weeks of age. If such pasture is not available, the sow and litter

should be kept in a clean sty or farrowing camp until the young pigs are at least three months of age. After that age the effects of parasitic infection are generally not so serious.

Three weeks after farrowing, the milk production of the sow usually reaches the maximum, and provision should be made to supplement the milk after this time. A good way to do this is by providing a grain ration for the young pigs in a creep or enclosure to which the sow cannot get. Shelled maize is a good feed to start the young pigs on; later they can be given some of the same ration as the sow. It is important that the young pigs should be eating grain before weaning. The pigs should be weaned at about eight weeks, depending on the condition of the sow and the quantity and nature of the feeds available for the young pigs after weaning. A few days before young pigs are taken away, the ration of the sow should be cut down and the proportion of protein decreased to reduce the milk supply and lessen the danger of udder trouble after weaning. It is usually more convenient to remove the sow from the young pigs than to reverse the process. Weaning should be completed in one operation, and usually it should not be necessary to return any of the young pigs to the sow. Any abrupt change in the feeding of the weaners should be avoided at this juncture.

When the sow's udder has dried up, the ration should be increased to bring the sow into rapidly improving condition when put to the boar. This plan is based on the practice of "flushing" sheep and is conducive to the production of large litters. The best time to cull unsatisfactory sows is after weaning. All sows which are poor producers, bad tempered, clumsy or pig-eaters should be cut out. No market herd can be kept up to a high standard without constant culling. The minimum breeding standard should be the ability to wean six to eight healthy pigs. One of the most effective ways of reducing the costs of production is to raise large litters per sow.

Shade and Comfort.—During the summer pigs should have plenty of shade. Where natural shade is not available, artificial shelters should be erected. In the hot weather a wallow is of value to keep the pigs cool. A little dip or used motor oil should be poured on the surface occasionally

to preserve it in a sanitary condition. The sleeping quarters should be dry.

In the winter the pigs should be protected from cold winds and draughts. The runs should be arranged so that the pigs can get in the sun when they want to. The sleeping quarters should be kept as free from dust as possible.

VETERINARY SECTION.

Good hygiene is as essential for the maintenance of health amongst pigs as it is for that of all animals. Unless they are kept under hygienic conditions and free from disease, either of an infectious or sporadic nature, they cannot thrive or reproduce to the best advantage. We are fortunate in Rhodesia in not having to contend against diseases such as hog cholera (swine fever), swine plague and swine erysipelas which are so prevalent in many other countries. Even our near neighbours in the Transvaal have with them an African type of swine fever which makes pig raising impossible in certain areas.

The absence of such diseases, however, should not in any way be regarded as a reason for failing to adopt the necessary precautions for preventing introduction of disease into one's swine herd; it should on the contrary serve as a stimulus to prevent and control those diseases which do exist, and to ensure that every effort be made to maintain the animals in perfect health.

There are with us, unfortunately, certain diseases which in far too many cases are responsible for failure in raising or marketing pigs, and it is the intention here to deal only with the most important of these conditions, which are not infectious diseases in the true sense of the term. Before dealing with them, however, it would be well to indicate briefly how to detect any deviation from normal health, and, when such departure is found, what points to pay special attention to in order to obtain information which will assist in arriving at a diagnosis and on which to base curative and preventive treatment.

Most pig breeders are familiar with the normal healthy habits of their stock, relying chiefly on their general appearance and activity, their appetite and the rate of growth or condition as a guide to their state of health.

A normal healthy pig appears alert, the eyes being clear and bright, the skin is clean, and, in young animals especially, has a gloss; notice is taken of any unusual sounds or movements and the animal is active and lively. Mature pigs are considerably less active than young ones, but nevertheless move about readily and are alert if disturbed. At feeding time the animals crowd round and readily—even gluttonously—consume the food when it is given. Young pigs thrive and grow out very quickly on a proper ration, and condition is maintained and increased, the animal appearing well rounded off, the skin evenly and smoothly covering all seats of prominence or depression.

In cases of disease many or all of the above characteristics of the healthy pig, depending on the nature of the disease, are absent. Dulness and listlessness are in evidence in most cases. Movement may be difficult or impossible. The appetite is capricious or may be in abeyance; thirst is increased in most febrile diseases. In diseases which persist for even a few days there is loss of condition and an appearance of general unthriftiness, and if this continues emaciation may become pronounced. In digestive disturbances the act of vomition, or indications of it, may be observed, or there may be signs of diarrhœa or constipation.

In conducting a general examination particular attention should be paid to points such as the above before proceeding to the more detailed special examination.

In observing the symptoms of any disease it is necessary first to examine the animals without disturbing them. This is best done by remaining outside the sty and watching for several minutes—particularly at feeding time. When doing this, particular attention should be paid to the type of breathing of the animal, e.g., whether normal, panting or deep, slow breathing, as this is masked when the pig is disturbed for closer examination.

Having obtained a good general impression of observable symptoms in this way, one should next enter the sty oneself and attempt to make the patient move round, or, preferably, get some one else to do this, and carefully note any peculiarities of movement, reluctance to walk or distress on walking.

One should next proceed to a closer examination of the animal. For such an examination it is necessary to have the patient caught and held securely by one or more assistants, but it is essential that the animal be dealt with carefully and not unnecessarily chased about. This examination includes taking the temperature—the normal varying from about 101 degrees F. in the morning to 103 degrees F., or even a few points more, in the afternoon—observing more closely any abnormalities already detected, e.g., any swellings or discharges, and noting any other points likely to assist in diagnosis, e.g., the state of the breath and the colour of the mucous membrane of the eye and mouth.

Should an animal die a *post-mortem* examination should be made, unless there is any suspicion that the disease may be anthrax, in which case the carcase should on no account be opened, but a blood smear made, care being taken that as little blood as possible escapes from the incision, and veterinary advice immediately sought. When a large number of pigs are suffering from any disease it is advisable to slaughter one and carry out a *post-mortem* examination with a view to arriving at a definite diagnosis, and hence being able to institute effective treatment for the others.

A *post-mortem* examination to be of any use must be thorough and must be performed as soon after death as possible; this is particularly important, as putrefaction sets in very rapidly and masks any changes in the organs which might otherwise have been detected. In order to be able to observe any deviations from the normal it is necessary to have a good idea of the general appearance of organs of healthy pigs, and one is therefore well advised when slaughtering pigs for consumption to spend some time in studying the appearance of such organs as the lungs, heart, liver, spleen, kidneys, stomach and intestines. Being familiar with the normal fits one much better for distinguishing disease changes when these are encountered.

A *post-mortem* examination is not complete unless all the above-mentioned organs are examined, and, in the case of the stomach and intestines, these should be opened with a pair of scissors throughout their entire length. Many deaths are attributed to mysterious diseases when the owner himself, by opening the stomach and intestines, could easily

have found the true cause in the shape of masses of round worms (*Ascaris*).

To adopt preventive or curative treatment without being able to diagnose the trouble is a most unsatisfactory, useless or even harmful procedure, and it is for this reason that some time has been spent on describing the essentials of clinical and *post-mortem* examination.

Measles (*Cysticercosis*).—The infestation of pigs with measles undoubtedly is responsible for the greatest number of carcases which are condemned as unfit for human consumption.

A measle (*Cysticurcus cellulosæ*) is the cystic, bladder worm or development stage of the human tape worm (*Tænia solium*). The pig is therefore the secondary host, harbouring only the immature stage, of an intestinal parasite of man, who is the primary host.

The life cycle is passed through in the following manner. Starting from the adult tape worm in the human intestine, eggs are produced and pass from the worm into the contents of the bowel, and are voided in the excreta. Such contaminated excreta may then be eaten by a pig, in which case the infective eggs on arrival in the stomach are acted upon by the gastric juices, the shell is dissolved and a minute parasite liberated. This embryo perforates the stomach wall, and, by migration into and transportation by the blood stream, arrives in the muscular system, where it undergoes further development, changing from the young embryo to a bladder worm (measle) stage. When fully developed and mature this is infective to man, and if the infested pig is slaughtered and the flesh containing the cysts eaten it develops further, becoming a tape worm located in the intestine. This matures and in turn develops eggs, and the life cycle is repeated.

The cyst may first be visible to the naked eye three weeks after becoming seated in the muscle. At this stage, however, it is easily missed. With development it enlarges, varying in size up to that of a small pea. It has a bladder-like appearance, light blue in colour and transparent with a white spot inside, which is the head of the future tape worm. The cysts are mature, i.e., fully developed and

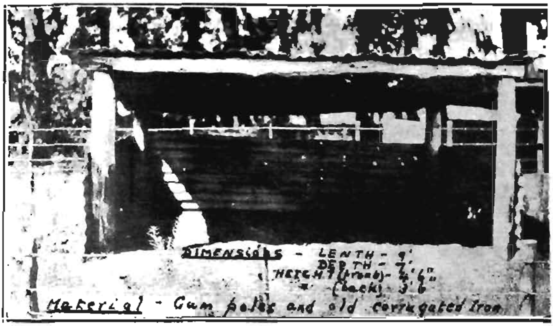


Fig. 7.
A simple colony house.

Fig. 8.
A good producer

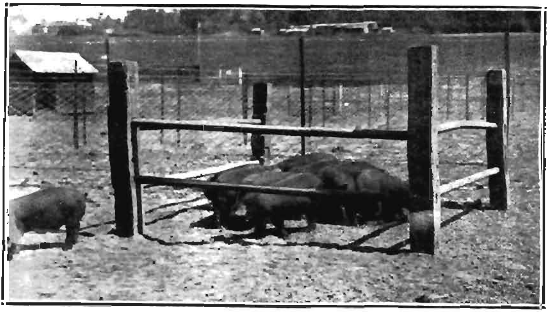


Fig. 9.
Young pigs feeding in a creep.

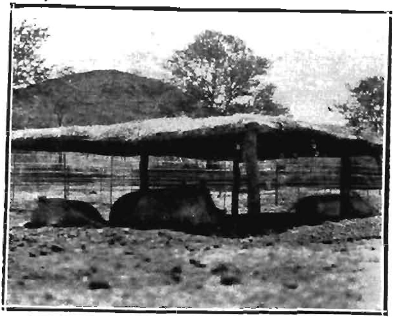


Fig. 10.
Artificial shade.

infective, after three to four months' development. Sometimes even before this stage, or at a variable later period, they degenerate, becoming opaque and hard, in which case they are no longer infective.

No symptoms are observable in the living pig. Infection is only diagnosed when the muscles are cut open after death, with the exception of those rare cases in which the measle cysts are visible on the under surface of the tongue. The parts in which the cysts most commonly occur are the muscles of the tongue, neck, thigh, forearm, heart, diaphragm and cheek.

There is no method of destroying measles in a live pig. Treatment therefore being useless, preventive measures are all that remain. Fortunately, owing to the knowledge of the life history of the parasite, these are simple and completely effective, and consist of preventing pigs from eating infected human fæces, or food contaminated with such. Infected humans should be put under curative treatment, and the use of latrines be encouraged, and finally, infected carcases of pigs should be destroyed to prevent further infection of man.

Ascaris Suum.—This is the most harmful worm parasite of pigs. Its babitat is the small intestine, and in this position sometimes hundreds may be found. It is a large worm, light cream in colour, five to eight inches long and about the thickness of a clinical thermometer or its case. No intermediate or secondary host is required for the life cycle. Eggs laid by the female parasite in the intestine pass out with the fæces, and under favourable conditions of warmth and moisture the embryos, still in the shell, develop on the ground to an infective stage in ten to fourteen days. Such eggs are very resistant to unfavourable influences, such as frost, drying and even ordinary disinfection, being stated to remain infective for up to five years or more. Such a ripe egg when ingested by a pig is acted upon by the gastric juices, and the larva is liberated in the stomach. The larva now bores its way into a blood vessel, and is carried to the liver, and thence to the lungs, where further development occurs. From here it passes into the bronchi, up the wind pipe, is coughed out through the larynx, swallowed and passes again into the stomach and into the intestine, where

it matures. The period of migration occupies about ten to twelve days.

The symptoms are variable on account of the complex development of the parasite. Their presence in the lungs frequently causes pneumonia in young pigs, the symptoms then being dulness, loss of appetite, difficult breathing and a cough. Death may result from a severe lung infection in one to two days. Where infection is less severe the young pigs are stunted and unthrifty, and show symptoms of coughing and difficult breathing. The cough may improve, and the only persistent symptoms are those of unthriftiness and distressed breathing (snuffles). Weaners may show the above symptoms, but usually the symptoms are more indefinite, the animals being stunted, pot-bellied and weak in spite of good food. Sometimes convulsive fits occur at feeding time. Symptoms are most pronounced in young pigs; adults may show a slight cough and lose condition. *Post-mortem* appearances depend on the symptoms noticed, e.g., pneumonia, when the young pigs die as a result of acute infection. Where the disease has persisted for a fortnight or so the mature worms are found in the intestine, and here there may be noticeable ulcers and hæmorrhages.

Treatment is only recommended in conjunction with prevention. It is no use allowing treated animals to remain on infected ground, especially when it is realised that the ripe eggs are so resistant. It consists of starving the animal for 24 hours and then drenching it with chenopodium oil and castor oil at the rate of 1 c.c. of the former and 8 c.c. of the latter for every 25 lbs. body weight. These drugs may be given in a little bran or mealie mash, but are then less reliable. The pigs may be fed as soon as the purgative has acted.

Prevention varies according to circumstances. Where infection does not already exist care should be taken to prevent its introduction, e.g., by procuring pigs from a known clean area, or, if any doubt exists, even these should first be freed from all infection by treating as above.

On infected farms the pigs may be moved to an area previously kept free, taking precautions to treat them before removal. If this is impracticable, a sow should be thoroughly scrubbed and washed immediately before farrowing to clean

her skin of eggs which may be present in the adhering dirt. She should be placed in a farrowing pen which has been previously cleaned with boiling water and caustic soda. Within ten days after farrowing the sow and her litter should be removed to a clean field planted with some suitable crop, the sow being removed after the young are weaned, and the weaners remaining there to grow up in safety. This method has been found to give excellent results whenever practised.

Scours (Diarrhœa).—One of the most common conditions causing serious losses in sucklings is scours. The cause can usually be traced to unsanitary conditions, wrong feeding or intestinal parasites. The feeding of the sow on mouldy or fermented foods, excessive maize, at irregular periods or suddenly changing her diet are frequently responsible for scours of sucklings. Diseases of the udder or infectious diseases of the sow are also manifested as scours in her litter. The symptoms are obvious. The fæces are fluid or pasty, frequently voided, light coloured and foul smelling, and the tail and hindquarters are soiled. Death may occur early or the disease may persist with marked loss of condition.

In weaned and older pigs the condition is also due to similar causes, bad and wrong food being the usual, if infectious disease and parasitism are excluded.

Treatment consists of removing the cause, i.e., the food, and hygiene should be immediately corrected. A purgative, castor oil, should be administered with a view to eliminating the irritating substance; in the case of sucklings the sow should receive the treatment. If the condition still persists, lime water given with the food in doses of 5 to 10 ozs. is said to be effective. Should parasites be responsible, the animals should be treated as recommended for ascaris infection.

Constipation.—This is usually the result of too concentrated foods, especially in conjunction with limited exercise. The food should therefore be corrected and provision made for sufficient exercise.

If the condition is acute an enema should be given. Purgatives, such as castor oil, linseed oil, or epsom salts, are also useful.

Pregnant sows should be allowed 3 ozs. of linseed oil daily in their slop feed as a preventive.

LEAF CURL OF TOBACCO IN SOUTHERN RHODESIA.

Report by Dr. H. H. Storey, Agricultural Research Station, Amani.

General Considerations.—The disease which is known in Southern Rhodesia as "leaf curl" is not a new one. Mr. Hopkins agrees with me that it is identical with that which he described as "crinkling" and farmers generally know as "Frenching" (but not the true "Frenching," which is a different disease). It has been of sporadic occurrence for a number of years.

The disease has caused alarm during the present season, owing to a small number of severe outbreaks. Although individual losses have been serious, I judge from the information given to me that the loss from this cause in the aggregate is likely to be small this season. The danger lies in future developments.

Seasonal fluctuations of the intensity of outbreaks are certain to occur, and it is possible that the present outbreak is of this nature. On general grounds and upon the analogy with the similar disease of cotton in the Sudan, I consider that, if left unchecked, the disease is likely to show an increasing severity of outbreaks in the future. I do not suggest that future prospects are alarming; but I urge that the control measures, which are the best that can be recommended in our present state of knowledge, should be carried out thoroughly by all farmers.

A diseased plant represents a total loss; if severe outbreaks become general, the aggregate loss to the industry would be serious.

The Nature of the Disease.—My examination of the plants in the field in Southern Rhodesia leaves little doubt

in my mind that the disease in this country is identical with that which I have studied at the East African Agricultural Research Station, Amani. My investigations there have shown that it belongs to the group of virus diseases caused by an invisible agent of unknown nature. The virus is naturally transmitted from plant to plant by a species of white fly (*Aleurodidæ*). The part played by the insect is that of transferring the virus from a diseased plant to a healthy one; in the absence of diseased plants the insect cannot produce the disease. Unlike the mosaic virus, the virus of leaf curl is not readily transferred mechanically, e.g., by handling plants. It is highly improbable that it persists in the soil or in the debris of tobacco plants.

During my visits to farms in the neighbourhood of Salisbury, white fly—probably of the same species as those in Amani—were found in all fields where leaf curl was present. There is, therefore, no reason to doubt its association with the disease in Southern Rhodesia. Experiments have been started, however, in collaboration with Mr. Hopkins to prove this association.

Although leaf curling is a manifestation of this disease, this feature is highly variable in different varieties and under different conditions. Curling may be caused by many agencies—aphid infestation, the inherited abnormality known in the Union as "Curly Leaf," etc. The important feature for diagnosis is the greening and thickening of the smaller veins on the lower surface of the leaf. This is most readily seen if the leaf be viewed against the sky. Occasionally an extreme form of this vein thickening is seen in the form of leafy outgrowths. If there is no greening of the veins, it must be regarded as doubtful whether the true leaf curl disease is present.

Control.—Once a plant is affected by this disease there is no possibility of its cure. The virus is distributed throughout its tissues, and all new growth will be affected. There is no known method of destroying the virus once in the plant without killing the plant itself.

Control measures can only be directed towards the prevention of infection. It will be clear from the earlier part of my report that the virus can exist only in diseased plants

or in white flies. If either of these links can be broken, the virus cannot continue to do harm.

The control of the white fly is an entomological problem. But I think I am correct in interpreting the views of entomologists in saying that no practical method is known for the control of white fly in tobacco fields.

I consider it to be possible that a study of the life history of the white fly might show some means for lessening infestation. In particular, I would suggest that consideration should be given to means for reducing possible infestations in seed beds.

The most hopeful method of control lies in the removal of the source whence the white fly obtains the virus.

It is almost certain that the virus is carried over the winter in some plants. It is possible that it survives in certain weed plants. One weed is known to harbour the virus in the Amani district. I was unable to find that species in the Salisbury district, or any other species which showed definite signs of being infected by this virus. While, therefore, the question whether alternate host plants of the virus occur in Southern Rhodesia must remain unanswered for the present, the possibility of their playing a part in the maintenance of the virus must not be overlooked.

There is, however, one certain means whereby the virus is carried over the winter. It is in surviving plants of tobacco in the previous season's lands. There is every probability that a large proportion of such plants will be affected by this disease. From them white fly carrying the virus of leaf curl will be disseminated in spring to the newly planted fields.

I regard therefore as the most important step for the control of the disease the thorough cleaning up of all tobacco lands as early as possible after the crop has been reaped. The earlier the old tobacco plants are destroyed and the longer the winter period during which there are no tobacco plants on the lands the more likely is successful control. Every farmer should make a point that no single tobacco plant survives through the winter upon his farm, in his native lands or garden. I cannot stress too strongly the serious effect which even a few ratooning tobacco plants

may have in the dissemination of this disease to the new crop.

An additional precaution which should be taken is the removal from the fields as early as possible of all plants which develop the disease during the growing season. These plants should be burnt or buried at once.

There is one other method of control which I consider should be exploited as an insurance against serious outbreaks in the future. This is the breeding of resistant strains of tobacco. It is necessarily work from which results cannot be expected for a number of years.

The selection for resistance can only be done in a region where heavy infection by this disease may be expected annually. At present there is no such region in Southern Rhodesia. I can, however, be fairly certain of heavy infection in my plots at Amani. I am, therefore, prepared, if my Director agrees, to undertake at Amani the preliminary selection. I would ask that I may be supplied with seed of all the tobacco varieties available in Southern Rhodesia. I will then endeavour to carry out pure line selections for resistance over two seasons, and then hand over the selected lines to your Department for trial and possible further selection.

Summary.—My views may be summarised as follows: The complete removal of all tobacco plants from the entire farm after the season's crop is harvested is likely to give satisfactory control of the disease. It is certain to reduce infection materially, but I realise that it may fail to give full control should there exist alternate host plants of which we are at present ignorant. I therefore recommend that the possibility of alternate host plants be investigated, and that the breeding of resistant strains of tobacco be carried out, if this be practicable, as a safeguard against a possible future breakdown of the direct control measures recommended.

TECHNICAL CONSIDERATIONS.

Nomenclature.—The name "leaf curl" appears to have been adopted in Southern Rhodesia, and I have consequently employed it in my report. It is doubtful whether it is well suited to this disease. In the Union this disease is known

as "crinkly dwarf." "Curly leaf" or "leaf curl" is there used for the inherited abnormality. Probably the same virus disease is known in Nyasaland as "cabbaging." A disease of very similar manifestation is known in Java as "kroepoek." Another disease is known in Java as "krulziekte" (usually translated into English as "leaf curl"), but it is uncertain whether this is identical with "kroepoek."

"Frenching" is obviously an unsuitable name.

I would favour a name which bore some reference to the enations, the most characteristic symptom of the disease. However, Dr. Butler recommends "leaf curl," which is the name now accepted for the analogous disease in cotton.

Symptom Expression.—The symptoms of the disease are extremely variable and render diagnosis often very difficult. I hope I am correct in regarding the enations (i.e., including under this term the simple greening of the veins) as the important diagnostic feature. I argue that they are an unusual form of plant abnormality; that, whereas curling of the leaves may have many causes, it is unlikely that the enations can have more than one cause. It is primarily on this basis that I diagnose the disease seen in Orinoco White Stem as identical with the Amani disease. I may say, however, that certain varieties in my plots at Amani have exceptionally developed a downward curling and savoying similar to that seen in Orinoco White Stem.

Although I regard the enations as necessary for diagnosis, I have had experimental plants, undoubtedly infected by this virus, which showed only mild curling without greening of the veins. It is probable that a close acquaintance with the disease in a particular variety may allow one to diagnose early cases without the enations.

The clearing of the veins is a character which I do not yet understand. In my transmission experiments it was usually transitory, and quickly disappeared. In my plots, however, I have rarely seen plants which retained this character in the pronounced form which I saw in the field occasionally near Salisbury.

Variation in Severity.—This is one of the most perplexing features of the disease. I am not clear as to the explanation. It is one of the points upon which I hope to obtain evidence in my future work at Amani. I suspect that variations in the individual reactions of the plant may play a part. I also suspect that there may be a number of strains of the virus of varying virulence. Hitherto in my experiments in transmission my plants have developed the disease only mildly, except in the instance of plants which were kept unprotected in the open through the winter, which produced very severely affected suckers.

Transmission Experiments.—I have produced this disease by feeding white fly, collected upon diseased tobacco, upon *healthy seedlings. I have failed to produce any disease* symptoms in seedlings fed upon by white fly bred upon healthy bean plants. I have not yet transmitted the disease with white fly bred on healthy plants and later fed upon diseased tobacco, owing to the difficulty which I have encountered in maintaining white fly on tobacco under artificial conditions. I have no reason to suppose that this experiment would not succeed.

In these experiments I have found it necessary to cage *considerable numbers of white fly in lamp glasses covering* the whole plants. The method of pressing a leaf against the open end of a glass tube has not heen successful.

The symptoms produced in the experimental plants have been a transitory clearing of the veins of young leaves, a mild curling characteristic of the variety under my con*ditions, the greening of some of the veins and a stunting* of the plants. This manifestation has been typical of the mild form of the disease in the field at Amani.

Alternate Hosts.—In the Amani district a composite weed, *Vernonia* sp., frequently shows enations on the veins similar to those in tobacco. I have successfully transferred the disease from *Vernonia* to tobacco by white fly bred on healthy bean plants. I propose to continue a search for alternate hosts of the virus, and will communicate to your Department any results that I may obtain.

In view of this finding, the species of *Vernonia* which occur in Sonthern Rhodesia are to be regarded with suspicion

as possible hosts of this virus. I recommend that officers of your Department pay particular attention to this genus. At the same time I recognise that alternate hosts may be found in any family. It would be advisable that your officers maintain a lookout for any wild plant showing enations of the type which characterise this disease in tobacco.

The White Fly Vector.—The species used in my experiment has been determined by Dozier as *Bemisia* sp. Kirkpatrick considers that it is probably identical with the *Bemisia gossypiperda* which transmits leaf curl of cotton.

It will be obvious to you that we are working on very uncertain grounds while we remain largely ignorant as at present of the life history of this species. In particular I consider that information is needed upon the over-wintering of the insect. If it should be found that pupæ may hibernate, it is likely that many would survive the winter attached to debris of diseased tobacco plants. Upon hatching in the spring, these individuals would probably be infective.

I recommend that this very important point should be investigated by your entomologists. If hibernation should be found to occur in this manner, the mere removal of the old plants after harvesting might prove to be insufficient to secure control. Efforts would need to be directed to the complete destruction of all tobacco debris.

A RECORD OF WHEAT FERTILISER AND VARIETY TRIALS

ON THE GOVERNMENT RESEARCH FARM, MARANDELLAS.

By T. K. SANSOM, B.Sc., Plant Breeder.

A series of wheat fertiliser and variety experiments were commenced by the writer in the winter of 1931 on the above farm. The land selected was typical of the better vlei soils of the district, and had been once ploughed in the winter of 1930 and then left fallow until early in 1931, when it was levelled and laid out in the requisite number of plots.

Wheat Fertiliser Experiments.—Before undertaking extensive fertiliser trials, it was considered necessary first to learn something about the moisture-retaining character of the land on which it was proposed to grow wheat for a number of years, and for that reason the experiments here recorded were designed to take the form more of a demonstration than a scientific enquiry. The results from the first season were intended to be used as a guide for future experiments, but unfortunately the operations on this farm were closed down towards the end of 1931, with the result that plans for the following season have had to be abandoned.

It is not possible to draw any definite conclusions from the experience of only one season, and the results obtained can only, therefore, serve to indicate the fertiliser or fertilisers which may be found suitable under similar soil conditions.

One acre of land was selected and divided into fortieth-acre plots, ten different treatments being adopted, with four replications of each. The plots were randomised, so as to overcome as far as possible differences of fertility and soil moisture.

The treatments per acre were as follows:—

"A" plots: No fertiliser.
"B" plots: 1,000 lbs. lime.
"C" plots: 2,000 lbs. lime.
"D" plots: 4,000 lbs. lime.
"E" plots: 200 lbs. bone and superphosphate, plus 50 lbs. muriate of potash.
"F" plots: 200 lbs. Rhodesian wheat fertiliser (complete: N. P. and K.).
"G" plots: 200 lbs. bone and superphosphate (1-3rd bone and 2-3rds supers.).
"H" plots: 2,000 lbs. lime, plus 200 lbs. Rhodesian wheat fertiliser.
"J" plots: 2,000 lbs. lime, plus 200 lbs. bone and superphosphate.
"K" plots: 2,000 lbs. lime, plus 200 lbs. bone and superphosphate, plus 50 lbs. muriate of potash.

It will be noticed that there are four series of treatments, namely, those receiving no fertiliser, those receiving different applications of lime per acre, those receiving different forms of fertiliser and those receiving a basic dressing of lime, together with the same fertilisers as in the third series.

The plots were sown on the 10th of May to Karachi wheat and all had germinated by the 16th May. Within the first ten days after germination, a very noticeable difference could be seen between the different series of treatments. The unfertilised plots presented a sickly yellow appearance, and to a lesser degree so did the plots receiving lime only. There was no apparent difference among the remaining plots until flowering time, but after this it was observed that the wheat on the plots receiving both lime and fertiliser bore larger and heavier ears.

The "A" plots yielded nothing—in fact, the plants grew to a height of not more than three inches and then died off. "B," "C" and "D" plots (lime only) likewise yielded nothing, and although the growth of the plants was a little better here, there was no apparent difference between the growth on the plots receiving the lowest and highest applications of lime. The table below gives the yield in lbs. of grain per acre for the different treatments:—

Plot series.	Average yield per acre of four plots.
"A" (no treatment)	Nil
"B" (1,000 lbs. lime per acre)	Nil
"C" (2,000 lbs. lime per acre)	Nil
"D" (4,000 lbs. lime per acre)	Nil
"E" (200 lbs. bone and supers., plus 50 lbs. muriate of potash)	214 lbs.
"F" (200 lbs. Rhodesian wheat fertiliser)	201 lbs.
"G" (200 lbs. bone and supers.)	193 lbs.
"H" (2,000 lbs. lime, plus 200 lbs. Rhodesian wheat fertiliser)	617 lbs.
"J" (2,000 lbs. lime, plus 200 lbs. bone and supers. per acre)	553 lbs.
"K" (2,000 lbs. lime, plus 200 lbs. bone and supers., plus 50 lbs. muriate of potash)	714 lbs.

In no instance are any of the yields good, the average rom the "K" plots being the best with a mean yield of a ittle over 3½ bags per acre. It must be borne in mind, ıowever, that the land was very raw, having only been oughly broken the previous season and having received ıo further preparation until just before sowing, owing to ›ressure of other work; during December and January it was ying under water to a depth of one inch or more in places. ʟime was not applied until April, and had, therefore, very ittle time to become effective.

It is of interest, however, to note that those plots eceiving lime in addition to fertiliser were definitely superior o all others. Unfortunately, it is not now possible to deternine whether wheat on the limed plots would have further esponded to this treatment in subsequent seasons.

Wheat Variety Trials.—These trials were conducted on a imilar piece of land. A basic dressing of 2,000 lbs. of lime, ılus 200 lbs. of Rhodesian wheat fertiliser, was applied per .cre, and 57 varieties collected from various sources in Rhodesia and elsewhere were sown.

At harvest it was found that about 60 per cent. of the arieties had set grain, the remainder being blind; this must ›e regarded as satisfactory, especially in view of the fact hat the writer was assured by several farmers in the district

that not a single grain of wheat would be reaped owing to blindness.

It was also fortunate that, on the whole, varieties which are generally recognised to be the better wheats for the Colony were those to set grain, and further selections could thus be made from these.

Of the varieties which showed most promise, Kenya Governor, Karachi, Pusa 52A, H.G.M.T2, Quality, Reward Ottawa, Garnet Ottawa, Droop 3 and Cawnpore were the best.

Date of Seeding Trials.—This experiment was designed to obtain information with regard to the optimum date of seeding wheat on the vlei lands of the sand veld. The following seven varieties of wheat—Kenya Governor, Karachi, Quality, Mentana, B.286, AES.5 and Klein Koren—were seeded at weekly intervals from the 1st May to the 26th June.

There was a distinct gradation from the earliest to the last sowings—in fact, the three last sowings (12th, 19th and 26th June) gave no yield whatever; in the other sowings the yield became progressively less the later the wheat was sown.

Of the above seven varieties tried, Mentana and AES.5 gave no yield whatever.

Conclusion.—It must again be emphasised that none of the results can be regarded as conclusive, as it is impossible to make recommendations on the work of one season only.

However, it does appear fairly obvious that on vleis typical of that on the Government Farm, Marandellas, the growing of wheat is not a commercial proposition until some form of fertiliser be applied, and also that the earlier the date of seeding takes place—within reason—the higher will be the yield, which, after all, is only to be expected. The advisability of wheat farmers testing the effect of dressings of three-quarters to one ton of lime per acre, in addition to farm manure or artificial fertilisers, is also indicated.

THE LESSER TOBACCO WIREWORMS.

By Rupert W. Jack, F.E.S., Chief Entomologist.

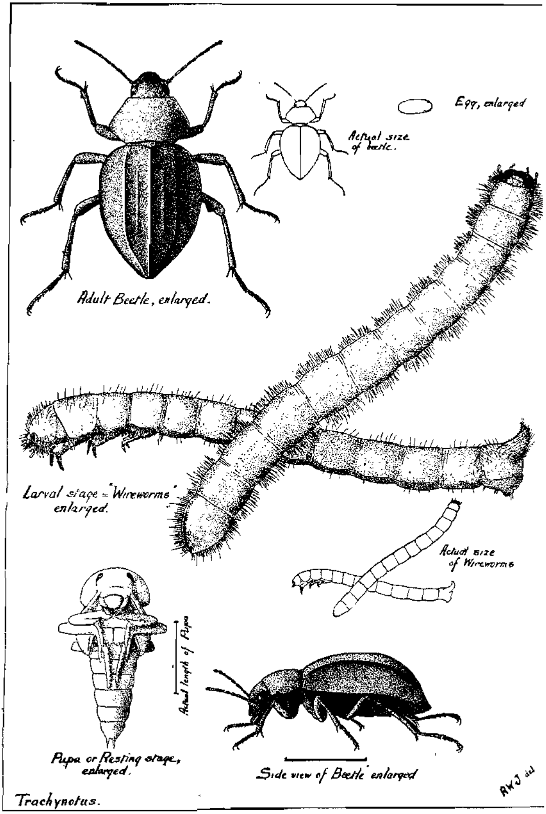
The most injurious of the so-called "wireworms" which attack tobacco, cotton and other crops in Southern Rhodesia belong to the genus *Trachynotus* (fam. *Tenebrionidæ*).

Effective control depends in the first place on the grower's ability to recognise the pest when it appears as a beetle from March to May. Prompt measures are necessary to destroy the beetles before egg laying has proceeded very far. It is hoped that the accompanying plate will be of assistance in this connection.

The reader should note that the actual size of the beetles and of the wireworms themselves is shown by the smaller outline figures adjacent to the larger shaded figures. The colour of the beetles is dull black, but they have a slight brownish or greyish appearance, due to the short hairs which clothe them. They are also frequently more or less covered with dust. In size and even shape they are variable within limits, the smallest specimen in the collection measuring only seven-sixteenths of an inch in length and the largest nearly eleven-sixteenths. It is not quite certain how many species are involved in injury, but the species figured, which has been determined as *T. geniculatus*, Haag., shows one common form.

The beetles live solely on the surface of the soil and are incapable of flight. They commonly congregate under shelter during the day and move about in a lively manner when disturbed.

The time of their appearance seems to vary considerably from year to year, and no doubt also with locality. Odd specimens have been seen as early as March, but as a rule they appear in numbers during April, and in the breeding cages at the Agricultural Laboratories a number have not


Egg, enlarged
Actual size of beetle.
Adult Beetle, enlarged.
Larval stage = "Wireworms" enlarged.
Actual size of Wireworms
Actual length of Pupa
Pupa or Resting stage, enlarged.
Side view of Beetle enlarged
RWJ del
Trachynotus.

emerged until May. They should be looked for from the beginning of April, and when they show up in numbers, baits should be applied at once.

The life history of the insect, as far as it has been elucidated, is as follows:—The adult beetles commence to lay eggs shortly after emergence from the soil, and continue to do so for some weeks. Eggs have been obtained in large numbers at Salisbury during the last week in April and the first half of May, a fact which illustrates the necessity of prompt action as soon as the beetles are present in numbers. The eggs are laid in the soil. They are small glistening white objects which lie loosely in the soil without adhering to the particles, and are commonly to be found at a depth of about a quarter of an inch frequently under some shelter such as dead leaves, grass, etc., where the beetles congregate. The eggs take apparently a month or more to hatch, which results in the young wireworm finding a very dry environment when it appears. It grows, however, comparatively rapidly during the winter, and by the time the next rains arrive, may have reached a length of an inch or more, which is about the length of the common species when it attacks the newly planted tobacco. Growth continues during the wet season, and the change to the pupa or resting stage commonly takes place in March. The pupa rests in a very flimsy earthen cell in the soil. The pupa stage lasts about three weeks, but the beetles do not apparently always come to the surface immediately they have emerged from the pupal skin and hardened. The life cycle thus may take one year, but a proportion of the grubs may remain over another year in a practically full-grown condition and not produce adults, therefore, until the second year. This fact constitutes something of a complication in regard to control measures, as it is clear that poisoning the adults one year will not necessarily free the land of all the wireworms of this genus by the next year. Breedings carried out at Salisbury have so far indicated that the one year cycle is the rule, but the question certainly requires further investigation.

The food of the wireworms during the dry season probably consists of the underground portions of plants and possibly of dry vegetable matter, but they may be to some

extent carnivorous. Certainly they injure each other very freely if at all crowded in confinement.

Their injury to tobacco and other crops in the early part of the rains shows, however, that they have a great liking for green plant tissue at that time. In confinement they have usually been fed throughout on sliced potatoes and similar foods.

Injury to tobacco usually consists in the wireworms eating into the underground stem, with the result that the plant promptly wilts. Similar damage has been reported in reference to *cotton*. The wireworms also commonly attack the germinating seed of *maize*, in this case not causing immediate wilting of the plant, but none the less assuring its practical failure. Cotton is sometimes heavily infested, the germinating seed and very young plants being eaten by the wireworms.

CONTROL MEASURES.

Whilst experiments have been carried out with a view to finding some means of destroying the grubs in the soil, they have not yet given sufficiently encouraging results to justify recommendations as to procedure along these lines.

Similarly, experiments to date have not yielded results justifying recommendations concerning the use of repellents which might be mixed with the soil at the time of planting. A repellent would probably need to retain its action for a considerable period to be of much value, but it is hoped that something useful in this connection will be found in the not too distant future.

It is in the adult or beetle stage that this pest appears most vulnerable.

In the first place the beetles like shelter, and observations in the field indicate that they tend to leave land which is smooth and bare. New land may, therefore, be broken during the previous wet season, and if thoroughly cleaned up and bare by April, should be less liable to contain wireworms in quantity when planted next season. It may be possible in some cases to follow the same procedure with certain old lands which are known to be infested with the pest. Clean cultivation tends to assist against this pest as against many others.

Owing to their liking for close shelter, the beetles can be concentrated in a large degree by distributing small heaps of grass or brush about otherwise clean land, and under these circumstances a large number could no doubt be destroyed mechanically by "boys" armed with flails of baling wire or similar weapons.

The beetles are, however, readily destroyed by means of poisoned bait, and in view of the fact that the available labour on a tobacco farm is usually thoroughly occupied in April and early May, bait, which requires much less labour, is no doubt preferable to hand methods.

The following formulæ have given good results. Maize bran moistened to a stiff dough with a solution of 1 lb. arsenite of soda in 20 gallons of water is the cheapest. A tablespoonful to each 10 square yards may be tried in badly infested parts of the field, but the most economical rate of distribution is still in doubt. Each bait should be covered over with a small quantity of foliage or similar shelter, as this not only serves to keep the bran moist, but also tends to attract the beetles. When the bait has dried it may be moistened again with a watering can. Some farmers report better results with Paris green, but this chemical is sometimes difficult to procure and is more expensive than arsenite of soda. One pound of Paris green to 180 lbs. of maize meal is recommended. The use of sugar or molasses in preparing the bait is not always convenient or necessary, and adds considerably to the cost. A formula consisting of arsenite of soda 1 lb., cheapest sugar 8 lbs. (or molasses 1 gallon), water 20 gallons, has been successful. Chopped green stuff (such as Napier fodder or lucerne) is dipped in the liquid and distributed broadcast over the land in the early morning or evening. Alternatively small quantities of the bait may be placed under shelter, as in the case of the bran mixture.

It is to be realised that there is doubtless much room for improvement in connection with the formulæ and the method of application of these baits. Large numbers of the beetles have, however, been destroyed by the methods described. Further investigations will be carried out in the near future.

MYCOLOGICAL NOTES.

SEASONAL NOTES ON TOBACCO DISEASES.

3. Frog Eye.
4. White Mould.

By J. C. F. Hopkins, B.Sc. (Lond.), A.I.C.T.A.,
Government Plant Pathologist.

Frog Eye.—One of the most serious diseases of the tobacco crop in Rhodesia, and one to which more attention needs to be paid by growers, is the leaf spot known generally as "frog eye." The idea still persists in some districts that frog eye is an unimportant disease which only appears on the bottom leaves of the plant, and that when these are primed off late in the season infection progresses no further. It would be as well if this illusion were immediately dispelled, because frog eye can cause heavy losses in individual crops, and two years ago was held responsible by a big buyer for putting a large proportion of that season's crop in the perished grades. The disease may be found upon almost any farm, and appears to be more prevalent now than it was some five or six years ago. If some whole-hearted attempt is not soon made to destroy old plants in the lands as soon as ever they have served their purpose, there is no knowing how severe frog eye may become within the next few years. It is to be hoped that the recommendations of this Department regarding early priming, which appear to be viewed more favourably since buyers have refused to take tissue-paper leaf, will be more faithfully adhered to in the future, so that we can anticipate a reasonable check being given to the disease before it establishes a firm hold upon the Colony.

Frog eye almost invariably makes it first appearance on the lower, yellowing leaves of plants in the seed beds. The spot is brown in colour, circular in shape, and often has an ashy-white spot in the centre, but this is not always present. If young plants are very chlorotic as a result of over-crowding or nitrate deficiency in the soil, then they may be severely attacked by the disease, so that most of the leaves possess large, circular, hrown spots. In any case, as it is not usual to remove the lower leaves from seedlings before transplanting, the spot is transferred from the seed beds to the lands, and it is not unusual to find every plant over an area of thirty or forty acres bearing one to several leaves infected by frog eye. As has already been pointed out in this Journal and elsewhere, three or four leaves at the base of the plant should be primed off, carried from the field and *destroyed* as soon as possible after the plants begin to make growth, so that infection is removed before the new leaves appear. It is of no use to prime off spotted leaves and allow them to remain in the furrows, for the first heavy rain will wash the fungus spores from the frog eye spots on to the soil, from whence they will be splashed on to the lower leaves of the plants and initiate a further outbreak of the disease; the crop cannot then be freed from infection.

The chief danger *does not*, however, lie in the spotting which is seen in the field; it is the brown or hlack spots which develop in the harns at temperatures of ahout 115 degrees which are responsible for the greatest amount of damage to the crop. This spotting is the direct result of frog eye infection, and should be strictly guarded against by the methods already indicated; but if infection of apparently clean leaf has occurred and the barn spot has made its appearance, then it may be checked to a certain extent by giving ample top ventilation and reducing humidity to the lowest limit of safety.

Remember that early priming will protect your crop from black barn spot.

White Mould.—There is no need for a description of this disease, which is well known to all tobacco growers. Although it is styled white mould in Southern Africa, yet it would be more correctly named mildew, for it is a typical

powdery mildew such as is found upon marrow, cucumber, asters and many other plants.

It appears in the tobacco lands at any time after the beginning of February, and is first seen upon the frills of the bottom leaves when these are allowed to remain upon the plants. Its subsequent spread to leaves higher up the stalk may be slow or rapid according to the conditions under which the crop is growing. Where plants are large and growth is rank, the familiar powdery coating of mildew spores may appear suddenly upon three or four of the lowermost leaves, rendering them unfit for curing.

Certain anomalies appear to exist in regard to the conditions which render plants susceptible to infection, but the disease usually makes headway at the time of year when cold night temperatures are first experienced. Tobacco grown at high elevations usually becomes infected earlier than crops at lower levels.

Various methods of control have been and are still being tested by the Department of Agriculture and Lands, but the most economical yet found is aeration of the field by early priming off the bottom leaves of all plants. No reduction in yield occurs if high priming is carried out before the plants are large, and there is no doubt that the quality of the leaf is improved. Farmers who have tried early priming are quite satisfied with the results, so that it is to be hoped that this operation will be adopted on all farms as a normal routine practice.

One word of warning—**beware** of handling mosaic plants and healthy plants at the same time. Separate boys should be told off to prime the former, and all boys should be made to wash their hands at the completion of each row of priming. In this way the spread of mosaic throughout a field can be prevented.

A full account of the trials carried out in the past few years for the control of white mould will be published in this Journal at a later date.

THE PRESERVATION OF FARM BEACONS.

By L. M. McBean, Acting Surveyor General.

It is remarkable how apathetic is the average land owner in this country in regard to the existence, position and maintenance of the beacons demarcating his property.

In the case of the grant of Crown land, the Government undertakes to point out the beacons to the grantee, and obtains a beacon receipt, which indemnifies the Government from further responsibility in the matter. The conditions of the title deed also include a clause by which the owner is held responsible for the maintenance of his beacons. In the case of transfer of the property, these conditions automatically apply to the transferee, who should first satisfy himself on the other two points—viz., the existence and position of the beacons. This important matter is often forgotten, particularly when the sale of the land has been effected by an agent in an office, when in reality the deed and diagram are sold and bought and not the actual ground which they represent.

The object of this article, however, is to deal rather with the question of the maintenance of beacons.

Although there may be no immediate intention of selling the whole or a portion of a farm, it is a possibility to be borne in mind. Indeed, one has only to observe the land history of any older country to see that it is a probability. In the case of transferring the whole property, the new owner will need to be satisfied that the beacons are in order, and in the case of a sub-division, a survey will be required, and the surveyor's fees will be considerably heavier if the old beacons have first to be re-located and re-erected. Apart from the question of the survey fees, the fact of beacons

being allowed to fall into disrepair is liable to cause endless litigation, as has been so often experienced in the Union of South Africa.

Fig 1

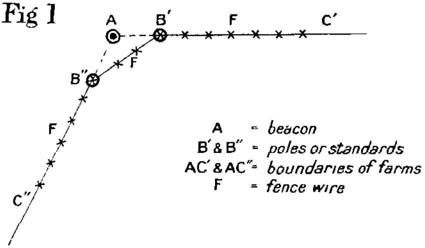
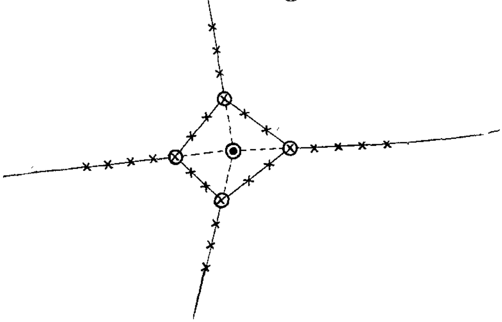


Fig 2



The chief trouble in this country, however, is not so much the passive neglect of beacons, but the wilful mutilation and often the outright destruction of beacons owing to the erection of fences. The prevailing custom is for the fencer to remove the beacon altogether, including the iron pin marking its centre, to dig a large hole and to plant

the corner pole of the fence therein. The pin and stones may or may not be replaced, but in any case the accuracy is gone, and the new mark is merely "somewhere about" where the original mark was placed. That beacon has now lost its value as an "original beacon," and is henceforth ignored both by surveyors and by the Court in cases entailing the "evidence of beacons." In other words, the fees paid for the survey of the land are a dead loss to the owner, since he has nothing to show for them but a diagram which may or may not represent the beacons of his ground.

The remedy is simple. Instead of having only one corner fence pole, terminate each line a few feet short of the beacon. (See Figure 1.) It might be argued that this means further expense to an already expensive undertaking, but I understand that it would only be a matter of 7s. or so at each point, and what is 7s. compared with £7 or more, which it would eventually cost to have the point refixed by survey? Also, granting the fact that fencing a farm is an expensive undertaking, the extra outlay of a few shillings would scarcely be noticed, and the advantages accruing would more than compensate for the extra expense.

Referring to Figure 1, the distance AB′ and AB″ should not be less than 4 feet, and the wires joining B′ and B″ should never be so close to the beacon as to interfere with its base.

Figure 2 shows the final result in the case of a beacon common to four farms. This beacon is left undisturbed and will remain so for generations—it is a real "landmark," and an indisputable beacon, and is automatically preserved by the enclosing wires.

If, therefore, farmers would bear this matter in mind and insist on this procedure when arranging for the fencing of their farms, they would save money, fulfil their obligations as to the maintenance of their beacons, and, at the same time, be doing a real service to Rhodesia in preserving such marks, which would be used as controls in the closer mapping of the country which must ultimately be undertaken.

ARE WHEEL-TYPE TRACTORS INJURIOUS TO TILTH?

The following short article has been taken from "The Implement and Machinery Review" of January this year. It raises a point which is of considerable interest and practical importance.

There is no doubt that the differences in the incidence of rainfall and general climatic conditions account for the very different soil conditions in this country from those in Great Britain.

We shall be glad, therefore, to hear from any users of tractors who are in a position to give any results on similar lines to those mentioned in the article or who would be prepared to make the necessary observations and supply this Department with the information gained.—Ed.

"Much might be said on both sides."—Addison.

"It is evident that wheel-type tractors have too long been blamed for their supposed ill-effects on the land and too little praised for the good they do, since an experiment which is even now being continued at the South-Eastern Agricultural College, Wye, Kent, shows, in the language of Addison's 'Sir Roger,' that there is no need to regard the matter from one aspect only. It would indeed appear that farmers have been too ready to talk about injurious 'packing' of the land and inventors have been too prone to devise 'non-packing' types of wheels, whereas the truth of the matter is that a good word can actually be said for the consolidation that the wheel-type tractor does. At any rate, it has been discovered, and it is put no higher than that for the moment, that during May of last year there appeared to be parallel lines of stronger growth in barley adjoining the experimental area at Wye, and it was established by the Engineering Department of the College that these lines were made by tractor wheels when disc harrowing two days before drilling the previous March.

The matter was thereupon closely investigated on the score of comparative plants per foot, tillers per foot, ears per foot, consolidation, and other factors with areas which had not been so over-run by tractor wheels, and it was seen that the differences in yield in favour of the tractor wheel track areas were most significant. Whether any other factors influenced the position materially or not cannot be excluded at the moment, but the point to be made is that here is sufficient proof to our minds that the talk about injurious 'packing' of the soil by tractor wheels has been a good deal overdone. Evidently the engineering authorities at Wye have also their reasonable doubts on the question of 'packing,' for they have decided to continue their experiments with a specially made roller, which has the same tread and pressure per sq. in. as tractor drive wheels. Three forms of treatment will be attempted, viz., unrolled, rolled in strips to see whether 'border' effects are responsible for the increase, and, finally, rolled all over to get a complete example of the compression. It would be injudicious to say more of the experiment at the moment, since those conducting it, although convinced of its possibilities, do not feel that anything really decisive has yet been obtained. But the further investigations which are now being made should at least provide useful data, and it is possible that some of the harsh things that have been said about wheel-type tractors and 'packing' may eventually be proved to be false and unsupportable."

HANDBOOK OF TOBACCO DISEASES.

Attention of readers is drawn to the fact that the Department of Agriculture has found it most inconvenient, with the present shortage of staff, to handle the local sales of this book. Arrangements have therefore been made with the Rhodesian Printing and Publishing Company for distribution by them throughout Southern Rhodesia. The book may be obtained from the Herald Store, Salisbury, price 4s., or, postage paid, 4s. 4d.

FARMING CALENDAR.

March.

BEE-KEEPING.

As the latter end of this month should herald the approach of the second and last real honey flow of the season, see that enough extra supers are ready for placing on hives as required, watching also that the fully drawn out combs of shallow frames that are on hand to fill them with are kept free from the wax moth; further, examine all supers that are already on the hives for this serious defect, though strong colonies will as a rule keep the combs free from this pest. March being usually a hot month, look well to the entrance; enlarge when and where necessary, and have ventilating lids on the tops of each hive. Extra ventilation can be provided for when required by placing small metal or wooden wedges underneath the top super, but not to be open enough to let out or in a single bee. Where quilts are noticed to have been eaten or more or less destroyed during the summer months, now is the time to make fresh ones so as to be ready for the closing down and the making snug of each hive when winter approaches; old flour bags or old deck chair canvas make capital quilts. Bees during this month will consume a quantity of water; see that some is always kept in the apiary in floating cork chips. This will save much labour and flight for them, as well as prolong their period of work and usefulness. As stated in last month's notes, flying swarms may be expected now any day, so prepare for their capture if required by having all details and items ready for immediate use. It is as well, however, at this date of the season to do without such swarms, unless the owner is prepared to feed them well during the winter months. March or April swarms, unless they are hived under conditions of providing *all the frames, of fully drawn out old combs, do not as a rule have* either the time or materials to provide for a strong colony before the winter sets in, and must perforce remain a weak one during that period. The axiom of every bee-keeper should be to let his colonies go into winter quarters brimming over with bees, not only to provide against the mortality that is bound to occur then, but to have a full hive to start the next season with.

CITRUS FRUITS.

Two thorough sprayings about this season, when the rains are usually practically over, at an interval of about two weeks, will often obviate the necessity for further work against scale insects until the beginning of the next wet season. If not already done, orchards should be ploughed and cross-ploughed and worked up into a really good surface, so that the cultivators can be kept going, say, every two weeks until it is necessary to irrigate, after which cultivation should be continued. If March prove a dry month, orange trees holding up a crop of fruit will probably require irrigation, but under normal weather conditions it should not be necessary. The same remarks apply as last month with regard to fruit moths. About the end of this month fall budding can be taken in hand, that is the insertion of buds that are intended to remain dormant until spring. This applies to higher altitudes, but in low country, where the growing season is extended, dormant budding should not be done until latter end of April.

CROPS.

Watch oats for rust, and, if badly infested, cut crop for hay as soon as weather permits. Ridge late potatoes, and if weather is dry prevent ridges from cracking, to check tuber moth infestation. Finish ploughing under all green manure crops while the ground is still moist enough to promote rapid decomposition. Late in the month begin to cut silage crops and ensile. Cut out barren maize plants and feed to stock or ensile. Cut Sudan grass for hay to permit of final late growth for autumn grazing. Reap any crops that are ready, and plough the stubbles at once. Lift ground nuts that are sufficiently matured. Watch for ground nuts making second growth; reap, and when sufficiently dry, place in cocks with nuts inwards and cover the top securely. Sow onion seed beds for winter crop. Watch the weather for hay-making and take advantage of fine spells. Towards the end of the month hay-making should normally be in full swing. Continue to plough all lands in succession immediately the crops are reaped from them. Vleis and irrigable lands should now be ready, or in process of being prepared, for winter crops. Early sowings of Algerian oats, barley or rye for green forage can be made. Allow any potatoes lifted to dry before storing them, but do not leave too long in the sun. Destroy witch weed and other noxious weeds. Continue to make all the kraal manure possible by throwing grass and litter into kraals, yards, etc. Begin to select in the field maize plants for seed purposes, and mark them with slips of coloured cloth. Press on with the breaking up of any virgin land which may have been stumped or cleared earlier in the year. Place orders for grain bags without delay. Early in the month silage pits should be cleaned out or, where necessary, new pits dug.

DAIRYING.

This is usually the most favourable month of the year for dairy operations. Cooler nights are now in evidence, and there is usually little difficulty in maintaining a low temperature in the dairy and cheese-room. If elementary precautions are taken, all cream should be first grade, and first-class cheese should be made, as a gassy condition of the milk is rare. Dairy cows, unless they are very high producers, can go without extra rations, because the grass is now in seed and grazing is ample. The cheese storeroom is generally full of cheese, and care should be taken to turn the cheese regularly. The windows and doors should be opened at night and closed in the daytime. A little mould on the cheese will not affect its quality, but if the mould is excessive the cheese should be rubbed daily.

Calves which are under four months old should be kept in and allowed to nibble at well-got hay; at the same time a little dry mealie meal and monkey nut cake will do them good and teach them to eat concentrates. An ample supply of clean water should be provided in the calf run.

ENTOMOLOGICAL.

Maize.—The stalk borers of the second brood may now be found in the stalks, but nothing can be done at this stage. Caterpillars sometimes attack the crop as a sequel to cultivation after grass weeds have made too much growth. The caterpillars attack the crop on account of their more natural food being suddenly destroyed. Prevention and not cure is indicated.

Tobacco.—The crop will by this time mostly have outgrown insect injury, but leaf miners and budworms may be in evidence. The latter are usually destroyed by hand when topping. Any plants affected with stem borer should be removed and destroyed.

Potato.—If ladybird beetles or caterpillars are injurious, spray with arsenate of lead (powder) 1 lb. to 30 gallons of water. Careful hilling should be attended to with the object of preventing and checking tuber moth attack.

Vegetable Garden.—If sawfly attacks plants of the cabbage family dust with Paris green 1 lb., fine sifted slaked lime 20 lbs. Against cabbage louse (aphis) wash plants frequently with a strong spray of water. Destroy blister beetles by hand. Plants of the melon family may be baited regularly with arsenate of lead (powder) 1½ ozs., treacle ½ gallon (or cheapest sugar 2½ lbs.), water 4 gallons, to keep down fruit flies. For leaf-eating caterpillars and beetles, etc., spray with arsenate of lead (powder) 1 lb. in 30 gallons of water on foliage which will retain water. Cabbages are best dusted.

Citrus Trees.—Collect and destroy infested fruit to keep down citrus codling. Fruit-piercing moths sometimes attack the fruit during the month, especially navels. They work at night and can only be dealt with at present by hand destruction. The trees should be watched for development of aphis and soft brown scale on the young growth and prompt measures taken. Resin wash at two-thirds standard strength is suitable.

Mosquitoes, House Flies, etc., may be very prevalent during March. Destroy breeding places. Poison or trap adult flies. Attend to screening of residence.

FLOWER GARDEN.

Flower seedlings for winter blooming should now be coming on, and should be planted out during showery or cloudy weather. Cuttings of carnations may now be made, and should be taken from selected plants which have borne the choicest blooms. The cuttings should be dibbled in half paraffin tins containing three parts sand to one of loam, and kept in a moist condition in a shady position sheltered from the winds. Make main sowing of winter-flowering sweet peas in a well-prepared and rich soil.

VEGETABLE GARDEN.

The sowing calendar is the same as that recommended for last month. Plant out from seed beds cabbage and cauliflower; care should be taken during this month, as the end of the rainy season approaches, to dig with a fork all the ground in the garden. The heavy rains settle this down hard, and as soon as the dry weather begins the soil cracks and lets out all the sub-soil moisture by evaporation. As soon as the rains cease entirely it is advisable to go over the ground and fine down with a rake, leaving some three or four inches of quite fine soil to act as an earth mulch.

FORESTRY.

Cultivation where necessary should be undertaken between the rows of trees planted out in previous months. If cultivation is carried out with the hoe, care should be taken not to pile earth round the base of the stems. New ground for next season's planting should be roughly broken up with the plough. Bulk plantings may be proceeded with during the month.

GENERAL.

At this time the condition of stock on the veld is usually good. It is well, however, to look ahead and make ready for the coming winter by the provision of winter feed in such forms as veld hay, silage, baled fodder from maize, manna, oats, teff, velvet beans, and the like, and by taking steps to ensure that water will be available for the stock in winter as near their grazing ground as may be.

POULTRY.

The breeding pens should have all been mated up by now, as the first chicks should be out by the beginning of April. Much more care should be used than is usually the case when selecting birds for breeding. Only the very best, i.e., the strong, healthy, vigorous ones from the best layers, should be chosen. A pamphlet on "Selection and Mating for Improvement" can be obtained on application to the Editor or the Poultry Experts. This deals fully with the subject. Always keep an eye on the male bird;

many are apt to get thin and run down in health, due to their allowing their mates to eat all the food. Such birds are better breeders than those that chase their mates away from the food. Every male that is being bred from should be given a good meal by himself each day, to ensure health and vigour. The incubator should be thoroughly overhauled, cleaned and disinfected before the eggs are put in.

STOCK.

Cattle.—Arrangements for winter feed should be pushed on. For a well balanced winter ration, in addition to good quality veld hay, a succulent feed such as maize silage, majordas or pumpkins and a legume hay such as velvet beans, cowpeas or dolichos beans are essential. The milk supply will begin to decrease. In the case of cows rearing calves it is often good policy in this month to cease milking the cows and to allow the calves to get all the milk from now on. Slightly increase the amount of grain to the dairy cows and increase the proportion of protein concentrate in the dairy cow mixture to make good the usual loss of feeding value in the grass. Bullocks fattening on grass will do better for a daily ration of some succulent feed such as green mealies or sweet potato tops.

Sheep.—Grass seed may be very troublesome. Keep the sheep on short grazing, or, alternatively, put them on to grazing which has been mown. Crutch the ewes due to lamb.

TOBACCO.

All late plants should be topped low to hasten maturity. The bales of cured leaf should be examined to ascertain whether or not the tobacco has been baled in proper condition. Seed heads should receive continued care. Land ploughed during February should be disced and rolled to assist the decomposition of organic matter. Tobacco fields already cleared of plants should be immediately ploughed. Tobacco bulks should be examined and turned, if necessary.

WEATHER.

Rains may be looked for in considerable quantity, though less than in previous months, 5 inches in Mashonaland and 3 inches in Matabeleland being normal, with as usual more on the eastern frontier. No useful rain need be reckoned upon after the end of this month, except on the eastern border, but the rainy season tapers off in an irregular and often erratic manner and without certainty.

April.

BEE-KEEPING

The notes given for last month will in the main apply to April also, according as to how the season develops. New swarms are not recommended to be hived during this month unless they are supplied in the first instance with fully drawn out frames and the owner is prepared to feed them now and again during the winter. As April should be a very active month for the bees, watch carefully the progress of the crates in which surplus honey is being stored, and have plenty of frames—fully drawn out if possible—ready fixed with foundation so as to place on extra crates as occasion may require; these should be placed under the full or filling one and not on the top, as might appear the case. For the benefit of those who would like a little honeycomb, it might be stated that if two or three shallow frames are fitted with four empty comb sections, and

placed in the crate, the bees will take to this plan and so provide both comb and honey for extraction in the one crate. In this African climate full crates can be left on the hive with safety until ready for extraction, but if any are taken off they must be watched now and again until they are extracted for damages from the wax moth, which in a day or so can ruin both the comb and honey.

CITRUS FRUITS.

During the first half of this month, autumn budding can still be performed if the sap is still up and the bark of the stock slips freely. Unprofitable and off type trees that have been headed back for top working and which have been carefully thinned out may have the shoots on which February-March buds have failed re-budded to profitable varieties. If the March rains have been sufficient and ploughing and cultivation have been completed, continue cultivation to retain soil moisture and destroy winter weeds. If a dry March has been experienced and cultivation has been badly performed, irrigation should be commenced or continued to keep the trees and fruit in good order. If not already applied to the unthrifty trees which are late with their autumn flush, soluble fertilisers containing nitrogen and phosphoric oxide can be applied with advantage to these trees. The fertiliser should be worked into the soil with a cultivator and followed up with an irrigation. Exporters should have everything in readiness for packing the early fruit, which should be fit to market about the end of the month. Scale infested fruit will be unfit for export unless treated at once. See entomological notes for treatment.

CROPS.

If sufficiently mature, begin cutting and stooking early maize over a small acreage and plough up the ground whilst still damp between the rows of stooks. If ripe, reap and husk early planted maize, and keep in a separate dump. Continue to make field selections of the best maize plants, and mark those required for seed with strips of coloured cloth. Lift any ground nuts and potatoes showing signs of making second growth. Make silage; cut maize for this when the ears are in the "dough" stage. Pick up and stook maize plants blown over to protect the ears from white ants. Feed sweet potato vines to stock, reserving any new growth of vines for feeding as grazing in May. Plough in any green manure crops not already turned under. Plough fallowed land. Keep potatoes reserved for seed on racks in a cool place protected from frost, but well ventilated. Transplant onions from seed-beds to irrigated or naturally moist lands; irrigate about once a week, but do not apply too much water. Pick over potatoes which may be lifted, and remove the bad and diseased ones. Winter cereal crops for grain can be sown towards the end of the month. Cart manure to the lands. Remember that good and deep ploughing to a depth of at least 7 to 8 inches is essential, and the basis of all successful arable farming. If the lands are not already ploughed so deep, increase the depth of ploughing about an inch a year until this depth, or even more, is reached. On lands which have been ploughed for a number of years at the same depth, use a grubber to stir up the sub-soil without lifting it to the surface. Too much attention cannot be paid to good tillage. It is usually good practice to follow the plough at once with a harrow or other suitable implement to break down the clods before they bake hard. Continue breaking up new lands; the earlier this is done the more complete is the decomposition of the vegetable matter in the soil. When making hay of coarse legumes such as velvet and dolichos beans and cowpeas, be sure that the vines are dry before stacking. Handle the hay as little as possible to avoid loss of leaf. Thought should be given to laying in supplies of thatching grass for thatching and repairing roofs. The veld may be beginning to dry off. Consideration may be given to mowing or otherwise preparing fire lines as a preventive against veld fires.

DAIRYING.

At this season of the year the milking kraal is generally far from clean owing to the excessive amount of mud or dust which has accumulated during the latter part of the rainy season, and in consequence farmers invariably have trouble in producng first-grade cream. Every endeavour should be made to erect a small milking shed in which four or five cows or more can be milked at a time, and every effort should be made to keep the cows clean. The udders should be wiped before milking with a clean, damp cloth, and the farmer should see that the natives' hands are washed with soap and clean water before and after each milking.

If butter is made, the cream and washing water should be put out overnight, and if the cream is churned early the following morning, very little difficulty should be experienced in obtaining a good grain and a firm body in the butter.

From this time of the year onwards, cheese making operations are usually most successful. The evening's milk should not be kept in the dairy, but should be placed outside, preferably in a bath, and covered over with butter muslin, cheese cloth or mosquito gauze netting. Care should always be exercised, however, in using evening's milk. Morning's milk plus a starter usually gives the best quality, and if a starter is used, care should be taken that it shows no signs of gasiness or off flavours.

The season of abundant green pasture is over, and the natural grazing, unless supplemented by some green food or succulent roughage, is not sufficient to maintain a full flow of milk. The most economical supplement to veld grazing at this time is maize silage, and this should be fed in liberal quantities to all milking cows and growing stock. A few pounds of concentrates in addition would also be of great benefit to the milking cows, which should not be compelled to subsist entirely on veld hay and silage.

DECIDUOUS FRUITS.

If not already done, orchards should be ploughed, harrowed and well cultivated to retain the soil moisture for spring blossoming and growth. Varieties such as the Chinese peaches, etc., may be pruned after the leaves have dropped.

Order all trees for winter planting during June-July. August planting is unsafe for many early growing varieties of fruits.

All late apples should be harvested and stored or marketed.

ENTOMOLOGICAL.

Maize.—Although certain pests, such as earworm and stalk borer, may be in evidence, there are practically no operations against insect pests that can be carried out economically during this month.

Tobacco.—Any remaining plants showing stem borer attack should be removed and burnt. Watch should be kept for the emergence of the adult wireworm beetles. These should be poisoned with a bait consisting of maize bran moistened with a solution of 1 lb. arsenite of soda in 20-30 gallons of water. The bait should be rolled into a small ball and scattered on the lands, one ball to each 10 square yards. The bait should be covered with a few leaves and moistened as required. Chopped green stuff such as Napier fodder may also be used as a carrier for the poison, in which case molasses should be added at the rate of 1½ gallons to 10 gallons of the arsenite solution, or cheapest sugar at the rate of 8 lbs. per 10 gallons. The bait is best laid in the evening.

Cotton.—Damage to bolls from bollworms may be noticed by the flaring of the bracts and the dropping of the bolls. All dropped bolls should be collected and destroyed. Guinea-fowl, turkeys, etc., may be encouraged to destroy stainers, etc. Stainers should be trapped in traps of cotton seed or trash and destroyed.

Citrus.—Collect and destroy infested fruit to keep down citrus codling moth. Red scale should be destroyed by fumigation with hydrocyanic acid gas or with resin wash. Soft brown scale may be controlled with resin wash. It will be controlled by fumigation with hydrocyanic acid gas where this is practised against other scale insects. Aphis may develop on young growth and may be kept down by spraying with nicotine or home-made tobacco wash.

Vegetable Garden.—Plants of the cabbage variety are liable to suffer severely from cabbage louse and Bagrada bug. The former can be kept largely suppressed by frequent washings with a strong spray of cold water or with a nicotine spray. Bagrada bug is more difficult to control. Crude carbolic emulsion, 1 part in 15 parts of water, or resin wash gives partial control. The spray must hit the insect to kill. Do not re-plant a cruciferous crop (cabbage family) on the same plot. Thoroughly clean and work the soil.

Potatoes.—Potatoes should be cultivated systematically and hilled up to keep the tuber moth from the tubers.

FLOWER GARDEN.

The garden can generally be depended upon to make a good show in the autumn and early winter, provided that the plants have been previously kept in a healthy condition by watering, mulching and feeding. Snap dragons and other seedlings, also cuttings, may now be planted out into their permanent positions. Sowing may be made of hardy annuals, such as hollyhocks, larkspur, clarkia, pansy, petunia, sweet peas, gaillardia and candytuft. Bulbs of spring flowering plants may be taken up, divided and replanted.

VEGETABLE GARDEN.

Sow at once all that is required to fill up the vegetable garden before the soil has parted with all moisture. Seeds sown now will germinate freely, and plants will establish themselves more quickly than during the colder weather, which can soon be expected. A start should now be made at cleaning asparagus beds. This is a most popular vegetable, and yet one rarely sees it cultivated in the ordinary Rhodesian garden. It is supposed to be difficult to grow, but this supposition is not borne out, as, once established, a bed of asparagus is one of the most easily managed vegetables in the whole garden. Depth of good soil and plenty of manure are all that this plant requires. Rhubarb roots may be taken up, *divided* and *replanted this month. Plant out from seed beds* cabbage and onion plants into their permanent quarters. Sow a full crop of peas, broad beans, turnips, onions, lettuce and radish.

FORESTRY.

Cultivate the soil in the young plantations either by means of machines or hand labour. The cultivation will conserve moisture. Hoed out weed growth should be applied as a mulch round the base of each young tree. Be careful not to pile earth round the stems of the young trees. Covering the stems with earth even for an inch or two interferes with sap circulation and invites attacks by termites.

Prune the young trees to single stems. Any exceptionally strong undesirable branch growth may be checked by breaking off the leading shoot, but ordinary branch growth should not be touched.

POULTRY.

The first chicks should now be out, and these, having been hatched, must be well looked after. No food should be given for the first 36 to 48 hours. Leave them to sleep as much as possible. See that they have plenty of fresh warm air, but are not exposed to draughts. After 48 hours give some small grit and charcoal to purify the intestinal tract and aid digestion. A pamphlet dealing very fully with incubation and rearing of chickens can be obtained gratis on application to the Poultry Experts, Department of Agriculture.

One comes across many cases of wrong treatment of chickens in this country, the chief being uncleanliness, over-crowding, giving food too early and dirty drinking water. Two most important foods are animal protein, especially in the form of thick separated or whole milk and green food, especially onions or eschalots or their green tops. The loss in the rearing of chicks is very great; this should not be so if good breeding stock is used, the eggs from these are carefully handled and incubated and the chicks reared with care and common sense.

Any turkey chicks hatched at this time of the year should be well looked after. They should be kept warm, dry, free from insects, fed on dry food only, given plenty of thick separated milk, onions or onion tops, dry mash and grain. A pamphlet on turkeys and turkey rearing is obtainable gratis from the Poultry Experts.

Ducks should do well during the month, the weather being as a rule cool, moist and bracing; but the houses in which they sleep must not be damp. Duck breeders should always be on the "qui vive" for a round worm called "Trichosoma contortum," which is often fatal to ducks. It is found in the œsophagus, and causes arrest of growth, emaciation and weakness and sometimes epileptiform attacks. A swelling will be noticed at the lower part of the neck, which rapidly increases in size, and death occurs in one to three days. Onions, or preferably garlic, mixed with the food is a good preventive and cure. Another good remedy is essence of turpentine mixed with twice its quantity of olive oil and one or two tablespoonfuls given for a dose.

STOCK.

Cattle.—Where winter conditions are good, early spring calves may be weaned now, but a common practice is to allow them to run with their dams until the early rains. Where supplementary feed is available, April to June are probably the best months of the year for cows to calve in. These months also suit the dairy farmer. Provide succulent feed for the dairy herd. Dry off cows which will not pay for a grain ration during the winter. Bullocks for winter fattening should be selected now.

Sheep.—The ewes should be kept in good shape for lambing. Put the big udder ewes on the green feed.

TOBACCO.

The grading of the brighter grades should be proceeded with as soon as convenient. All leaf which has cured green should be bulked separately and be regularly examined to avoid serious damage through overheating. Tobacco seed heads, when mature, should be removed from the plants and stored where no damage will occur through activities by rats and mice. Care should be taken to store these seed heads with the pods uppermost, as otherwise much seed may be lost. Clear and plough the land soon after the crop has been harvested. Burn old stalks as a control measure against possible carry over of disease

SOUTHERN RHODESIA VETERINARY REPORT.

December, 1931.

AFRICAN COAST FEVER.

No fresh outbreaks. The slaughter of the infected herd on the farm Hillside, Melsetter district, had not been completed by the end of the month.

FOOT AND MOUTH DISEASE.

Victoria Veterinary District.—The District Veterinary Surgeon reports as follows:—

"No fresh infection occurred during the month, but there were several recrudescences of disease in areas where it was considered infection had disappeared, but where all cattle had not been definitely known to have picked up the original infection.

"It is also of particular interest that all recrudescences were the result of recommencing dipping, thus tending to show that the fact of bringing cattle in close contact at the tank kraal is sufficient to ensure a rapid spread of infection, as in each case the spread of infection was noticed within a month of the first dipping, usually on the third dipping day—that is, a fortnight after the initial dipping.

"It further appears very definite that once infection gets into any large native area it remains in that area until all cattle have been exposed to infection, and is capable of causing a recrudescence in clean cattle for long periods after all active infection appears to have died out. Take Mataruse tank area, Victoria Reserve, as an example: All evidence of any active infection disappeared early in September, when 26 herds still remained clean. Dipping commenced early in December. At the third dipping, i.e., 14 days afterwards, 16

of these herds showed infection with a high percentage of infection. A similar condition was noticed in the Chibi district at M'Seba, Gororo, Shiko and Matenda tank areas; except at the former two tank areas, infection was thought to have disappeared towards the beginning of June, and except for the fact of finding a koodoo bull with lesions of foot and mouth and the assumption at that time that game would probably be a factor in spreading infection, these areas would have been shown as cleared up months ago.

"In view of this experience, it seems that once any native area becomes infected, every effort should be towards exposing all cattle to infection as quickly as possible, and that our past method of dealing with these areas by segregation and suspension of dipping is wrong, unless there is some special reason why the spread should be retarded, and further, it would seem that a rapid spread with a high percentage of infection can be obtained by bringing all cattle in close contact at the dipping tank, in which case the question of inoculation to accomplish a similar condition may not be necessary, and need only be resorted to if the former and more simple method fails.

"In existing areas of infection other than those mentioned, the disease is running the usual course, except on Maybrook Farm, where infection is in a very mild form and is only slowly spreading in any visible way.

"There is still slight infection remaining at Maranda's, but disease has entirely disappeared in Matibi No. 1 Reserve.

"There has been no further spread in the Chikwanda Reserve, but I am of opinion the disease will eventually spread to the balance of the cattle.

"Zimutu Reserve was cleared up during the month."

Gwelo Veterinary District.—In the Chilimanzi Native Reserve infection appeared amongst some herds in the Gundura section, which had not been infected previously. Infection is still active in the Janjuri and Rutunga sections of this reserve. The disease is clearing up on the farm Driefontein, but is still active on the adjoining farm Grootfontein.

In the Selukwe district fresh outbreaks occurred on the farms Lubonga, Pakame, Gundule, Guruguru and Wilsons.

In the Selukwe Native Reserve infection appears to be at an end.

Fresh infection appeared in the northern section of the Lundi Reserve, Belingwe district, which escaped the disease during the earlier stages.

In the Gwelo district some slight infection remains on Vigers.

BULAWAYO VETERINARY DISTRICT.—In the Bubi district the whole of Battlefield Block is now infected except one kraal, and infection extended to three herds on the adjoining Ntabezinduna Native Reserve, in the immediate vicinity of the Battlefield Block boundary. Infection reappeared on the Shangani Ranch. The homestead paddock was first infected, and infection was carried from there to other paddocks by ordinary ranch movements.

In the Belingwe district the disease advanced on the Belingwe Native Reserve from the vicinity of the Mondi River, north of the Mwesa Range, in a south-westerly direction as far as the Nuanetsi River, and across the Biti River, in the vicinity of Rupongi Hill. Infection is still active on the farms Mnene, Mnene Extension and the Bala section of Lou Estate.

In the Gwanda district all cattle along the Limpopo River between the Pazhi and Tshilatshokwe Rivers were moved back to Masera tank. On Liebig's Ranch some infection still exists on Sections 1, 4, 6 and 9. The only cattle on this ranch which have not been infected are one herd at Mazunga and eleven herds in the north-west corner of Section 7. In the Siyoka area infection spread up the Msano River to the north of Mahado Halt, and all the cattle involved were removed to Siyoka for inoculation. The disease crossed the cordon line on the Tshabezi River, and all the cattle involved were moved to Siyoka for inoculation.

Inoculation: 5,959 head of cattle were inoculated at Simales kraal and 100 per cent. reactions resulted in susceptible cattle. It was noted that animals which had previously had an attack did not react to inoculation. Infection on the Bubye and Bubyana Rivers appears to have died out.

SALISBURY VETERINARY DISTRICT.—Fresh infection was found at several kraals in the Chiweshe Reserve, Mazoe district. This reserve was infected in July last, and the disease appeared to have been confined to three kraals and to have disappeared, as there had been no evidence of infection since October last. It was decided to inoculate all the cattle in the dipping tank areas involved by the fresh infection, and at the end of the month this work was in progress. No evidence of infection at or in the vicinity of other previously infected areas.

SCREW WORM IN CATTLE.

Prevalent in various districts. In the Victoria district it is proving a severe and troublesome complication in cases of foot and mouth disease with open foot lesions.

TRYPANOSOMIASIS.

Several deaths in cattle reported from the southern portion of the Melsetter district.

SCAB IN SHEEP.

The District Veterinary Surgeon, Melsetter, reports that on inspecting a flock of sheep after double dipping at an interval of ten days he was able to demonstrate the living parasites in the infra-orbital fossæ of Merino sheep, and points out that failure to deal properly with this site must lead to recurrences of infection.

IMPORTATIONS.

From the Union of South Africa and Bechuanaland Protectorate:—Bulls, 2; cows and heifers, 156; oxen, 67; horses, 7; donkeys, 48; sheep, 1,727; goats, 128; pigs, 20.

EXPORTATIONS.

Nil.

J. M. SINCLAIR,
Chief Veterinary Surgeon.

SOUTHERN RHODESIA WEATHER BUREAU.

JANUARY, 1932.

Pressure.—Pressure was generally above normal during the month and the fluctuations were small.

Lows.—Numerous lows were in evidence, but their effect was small. A deep low was on the south-east coast on the 1st, and appeared to move up the Mocambique Channel. This is very unusual. Two weak lows passed along the south and south-east coasts early in the month, and the second was succeeded by the equatorial low which extended well into the Union on the 12th; it moved to the west on the 13th, deepened on the 14th, and swung to the south-east on the 15th; movements continued to the 18th. On the 21st and 22nd a weak low passed along the south coast, and was succeeded by the equatorial low which extended into the Union and Southern Rhodesia and finally withdrew on the 28th.

Highs.—The movements of highs were generally weak and irregular.

A high appeared on the west coast on the 1st and passed off. The second appeared on the 4th and moved round, controlling the pressure system until the 11th. The third appeared on the south-east coast on the 19th and was in evidence up to the 22nd.

Temperature.—Temperature and humidity were generally about normal.

Rain Periods.—Rain fell in two periods during the month. Light showers were numerous on the 1st and fairly general in the north on the 2nd and 3rd; numerous in the north on the 4th, and isolated showers fell from the 5th

to the 7th. Isolated showers fell on the 12th and 13th, and showers were fairly general from the 14th to the 19th; from the 20th to the 22nd showers were more general in the south, but became general from the 23rd to the 25th. The rain fell off from that date and was confined to the north to the end of the month.

Rainfall.—The rainfall for the month was 5.5 inches, as compared with the average of 7.1 inches. The distribution was as follows:—

Zone.	Rainfall, Jan., 1932.	Average, January.
Zone "A"	6.7	6.3
Zone "B"	4.0	5.6
Zone "C"	6.3	7.6
Zone "D"	5.0	8.2
Zone "E"	5.2	7.8
Zone "F"	5.1	12.5

The heavy rain in Zone "A" and the very low rainfall in "F" are outstanding.

JANUARY, 1932.

Station.	Pressure Millibars, 8.30 a.m.		Temperature in Stevenson Screen ° F.								Rel. Hum.	Dew Point	Cloud Amt.	Precipitation.			Altitude (Feet).
			Absolute.		Mean.												
	Mean.	Normal.	Max.	Min.	Max.	Min.	½ Max. ½ Min.	Normal.	Dry Bulb.	Wet Bulb.	%	F.	0-10	Ins.	Normal.	No. of Days.	
Bulawayo ...	867.7	866.5	95	52	83.0	61.5	72.3	71.4	71.3	63.0	63	58	6.0	4.32	5.8	6	4,436
Gwelo	861.5	...	93	53	82.1	60.6	71.4	71.4	70.8	64.2	70	61	4.5	4.99	6.0	16	4,632
Riverbank ...	...	...	102	55	86.4	62.2	74.3	74.4	73.4	65.6	66	61	...	6.39	6.3	15	4,100
Essexvale ...	...	...	102	50	87.9	64.3	76.1	73.9	71.9	64.8	68	61	..	4.79	6.4	12	3,828
Gwanda ...	909.1	...	102	56	86.8	65.4	76.1	...	75.5	65.8	60	61	4.2	3.64	5.8	5	3,235
Mazunga ...	947.6	945.6	104	56	91.9	66.8	79.4	76.8	78.0	62.0	39	51	5.5	4.48	3.3	8	1,970
Nuanetsi ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3.7	...	1,630
Between Rivers	...	...	92	52	84.9	60.4	72.7	...	71.2	66.0	76	63	6.6	5.83	7.6	14	3,970
Enkeldoorn ...	...	...	89	53	80.3	59.9	70.1	70.2	70.3	63.3	68	60	5.2	7.73	7.1	15	4,720
Gatooma ...	...	...	95	52	85.6	61.2	73.4	74.3	73.2	66.4	70	63	5.6	7.40	7.6	17	3,850
Miami	...	...	87	57	80.2	62.7	71.5	...	69.2	64.9	80	63	5.8	5.23	9.1	16	4,090
Salisbury ...	854.1	853.6	86	51	79.7	60.0	69.9	69.3	69.3	63.1	71	60	6.9	5.15	6.1	15	4,865
Sinoia, Citrus ...	...	...	...	55	...	61.5	...	...	72.8	66.9	74	64	...	4.50	7.6	10	3,830
Sipolilo... ...	...	...	88	54	81.2	62.9	72.1	...	71.9	65.5	71	62	5.9	3.37	9.0	11	3,900
Juliasdale ...	...	...	81	47	72.3	54.7	63.5	63.3	65.3	61.2	79	59	...	8.70	10.9	16	6,070
Mtoko	...	...	86	55	79.8	61.8	70.8	...	71.1	65.0	72	62	6.1	4.85	8.1	6	4,210
Shamva ...	...	...	92	55	85.5	64.0	74.8	...	74.0	68.0	72	60	5.8	3.19	8.1	9	3,170
Angus Ranch ...	...	...	100	60	89.8	70.0	79.4	77.2	78.5	70.7	68	67	...	4.23	5.8	9	2,300
Craigendoran ...	...	...	96	54	85.9	62.9	74.4	...	78.4	68.2	59	64	...	3.50	8.1	12	3,430
New Year's Gift	...	...	92	56	84.2	63.3	73.8	...	73.7	67.0	71	63	...	4.52	8.3	10	2,700
Nyamasanga ...	...	...	84	...	78.4	...	...	...	69.3	62.2	67	58	...	6.85	...	15	5,080
Riverdene North	...	...	96	50	85.5	61.2	73.4	...	72.2	66.0	72	63	...	4.20	7.6	12	3,700
Stapleford ...	...	...	80	44	71.7	54.6	63.2	...	65.4	61.0	78	58	6.1	11.26	18.8	18	5,450
Umtali	891.0	890.7	93	52	81.5	62.0	71.8	71.9	72.5	65.5	69	62	4.7	3.73	8.4	13	3,677
Victoria ...	894.2	893.0	94	53	82.2	60.5	71.4	72.3	72.5	66.6	73	63	6.2	7.55	6.5	15	3,570
Melsetter ...	849.4	...	84	51	75.6	58.3	66.9	...	68.7	62.9	72	59	3.5	5.06	11.8	14	5,060
Mount Selinda	...	...	89	50	78.5	60.2	69.4	...	71.1	64.7	71	62	5.6	6.53	16.0	13	3,520

GWEBI PRODUCE PRICES.

Hull-less oats	40/- per bag of 150 lbs.
Large Black sunflower seed ...	14/- per bag of 100 lbs.
Dolichos beans	35/- per bag of 200 lbs.
Linseed	60/- per bag of 200 lbs.
Linseed (quantities under 100 lbs.)	4½d. per lb.
Sweet potato tubers (Calabash Leaf)	6/- per bag of 150 lbs.
Napier fodder roots	6/- per bag of 40 lbs.
Sweet potato cuttings (Calabash Leaf)	6/- per bag of 40 lbs.
Edible canna corms	10/- per bag of 150 lbs.
Pumpkin seed	1/1 per lb.

All prices quoted are for *delivery free at any station or siding* in Southern Rhodesia. Before sending cheques, intending purchasers are advised to ascertain that the seeds, etc., required are still available. Cheques should be made payable to "Gwebi Farm." All orders and enquiries should be addressed to the Chief Agriculturist, Department of Agriculture, Salisbury, *not direct to the Gwebi Farm.*

DEPARTMENTAL BULLETINS.

The following Bulletins, consisting of reprints of articles which have appeared in this Journal, are available for distribution at 3d. per copy. Application should be made to the Editor, Department of Agriculture, Salisbury, and remittances must accompany orders.

AGRICULTURE AND CROPS.

No. 225. Napier Fodder or Elephant Grass, by J. A. T. Walters, B.A.

No. 374. Fibre Crops—Deccan Hemp (Hibiscus Cannabinus) and Sunn Hemp (Crotolaria Juncea), by J. A. T. Walters, B.A.

No. 429. Propagation of Kudzu Vine, by H. C. Arnold.

No. 442. Swamp or Irrigation Rice, by K. V. Yoshi, Bombay.

No. 510. Check-row Planting of Maize, by H. G. Mundy, F.L.S.

No. 545. Artificial or Synthetic Farmyard Manure, by H. G. Mundy, Dip.Agric., F.L.S.

No. 550. Onion Growing under Irrigation, by C. Mainwaring.

No. 561. Wheat Growing in Rhodesia, by C. Mainwaring.

No. 568. The Treatment of Arable Land, by G. N. Blackshaw, O.B.E, B.Sc., F.I.C.

No. 598. Drought-resistant and Early-maturing Crops for Areas of Late Rainfall, by C. Mainwaring.

No. 599. Rhodesian Soils and their Treatment, by E. V. Flack.

No. 630. The Storage of Seed Potatoes, by H. C. Arnold.

No. 634. Barley, by P. V. Samuels.

No. 643. Noxious Weeds in Southern Rhodesia, by F. Eyles, Botanist.

No. 650. Coffee Culture in Southern Rhodesia, by G. W. Marshall, Horticulturist.

No. 651. Two Important Leguminous Crops: The Velvet Bean and Dolichos Bean, by C. Mainwaring, Agricultnrist.

No. 657. Hay-making in Southern Rhodesia, by C. Mainwaring, Agriculturist.

No. 663. The Use of Fertilisers and Manures in Southern Rhodesia, by A. D. Husband, A.I.C., Chief Chemist.

No. 672. Hay-making in Rhodesia, by H. G. Mundy, Dip.Agric., F.L.S.

No. 674. Top Dressing of Maize against Stalk Borer, by H. C. Arnold.

No. 681. The Sunflower (Helianthus Annuus) (Revised), by S. D. Timson, M.C., Dip.Agric.

No. 694. The Edible Canna (Canna Edulis), by D. E. McLoughlin.

No. 695. The Castor Oil Plant (Ricinus spp.), by S. D. Timson, M.C., Dip.Agric.

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